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U.S. ENVIRONMENTAL PROTECTION AGENCY
EPA NEW ENGLAND

RECORD OF DECISION

OPERABLE UNIT 1

CALLAHAN MINE SUPERFUND SITE

SEPTEMBER 2009

Callahan Mine
5.4
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DECLARATION FOR THE RECORD OF DECISION

A. SITE NAME AND LOCATION

Callahan Mine Superfund Site
Brooksville, Hancock County, Maine
MED980524128
Site ID No: 0101028
Operable Unit 1

B. STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Operable Unit 1 (OU1) at the Callahan Mine Superfund Site in Brooksville, Maine (the Site). The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. § 9601 *et seq.*, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300, as amended. The Director of the Office of Site Remediation and Restoration (OSRR), United States Environmental Protection Agency New England Region 1 (EPA) has been delegated the authority to approve this Record of Decision (ROD).

This decision is based on the Administrative Record, which has been developed in accordance with Section 113(k) of CERCLA, and which is available for review at the Brooksville Library, Brooksville, Maine, and at the EPA, OSRR Records Center in Boston, Massachusetts. The Administrative Record Index (Appendix D to the ROD) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

The Maine Department of Environmental Protection (Maine DEP) concurs with the selected remedy (Appendix B).

C. ASSESSMENT OF THE SITE

The response action selected in this ROD is necessary to protect the public health and welfare or the environment from actual or threatened releases of hazardous substances into the environment.

D. DESCRIPTION OF THE SELECTED REMEDY

This ROD sets forth the selected remedy for OU1 at the Callahan Mine Superfund Site. This will be the first response action for the Site. Upon completion of the OU2 Remedial Investigation and Feasibility Study (RI/FS), EPA may identify the need for additional response actions as part of OU2 at the Site.

The selected remedy for OU1 at the Callahan Mine Superfund Site was identified as Alternative CMS2 in the OU1 Feasibility Study and in the Proposed Plan. The selected remedy for OU1 includes the following major components:

- Performance of pre-design investigations and studies;
- Construction of surface water diversions to reduce the amount of upslope runoff flowing onto and infiltrating the Tailings Impoundment;
- Installation of a low-permeability cover system to contain and isolate the Tailings Impoundment (cover material to be quarried from on-site);
- Installation of a horizontal drain, or other drainage methods (e.g., vertical wells or drains), to facilitate the dewatering of the Tailings Impoundment and the collection and treatment of the discharge from the horizontal drain, or other drainage methods (e.g., vertical wells or drains), in a constructed wetland (It is possible that additional measures, including a toe shear key or buttress would be identified during design as a necessary component to stabilize the Tailings Impoundment);
- Subaqueous disposal of Waste Rock Pile-3, Ore Pad, and Mine Operations Area source material, and Residential Use Area soil exceeding cleanup levels in a confined aquatic disposal (CAD) cell in the submerged former mine pit in Goose Pond;
- Excavation and off-site disposal of material contaminated with polychlorinated biphenyls (PCBs) exceeding site-specific PCB cleanup levels and petroleum-contaminated soil commingled with CERCLA waste;
- Dredging and subaqueous disposal of sediments exceeding the sediment cleanup levels from southern Goose Pond and the adjacent salt marsh into the CAD cell in the former mine pit;
- Mitigation, restoration, and compensation for wetland impacts, including the dredging and subaqueous disposal of Dyer Cove and Goose Cove sediments that contain mine waste in the CAD cell in the submerged former mine pit, along with other measures that may be identified in remedial design;
- Implementation of institutional controls to prevent disturbance to the components of the remedy and long-term monitoring of compliance with the restrictions;
- Installation of monitoring wells;
- Performance of long-term operation and maintenance, and monitoring; and
- Performance of five-year reviews to continue to evaluate potential human-health and ecological risks due to exposure to contaminated waste material being permanently managed on-site.

The estimated present value cost of the selected remedy for OU1 is $22.8 million.

E. STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action (unless justified by a waiver), is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

The selected remedy is not able to achieve the statutory preference for treatment as a principal element of the remedy (i.e., reduce the toxicity, mobility, or volume of materials comprising principal threats through treatment) due to site conditions and the balancing all of the CERCLA criteria for selecting remedial alternatives. Some limited treatment of materials will occur as a result of the use of a wetland treatment system that will treat the discharge from horizontal drains, or other drainage methods, that will be used to facilitate the dewatering of the Tailings Impoundment.

Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure (including groundwater use restrictions and measures to protect covers over contaminants left on-site), a review will be conducted within five years after initiation of remedial action and, at a minimum, every five years after that date, to ensure that the remedy continues to provide adequate protection of human health and the environment.

F. SPECIAL FINDINGS

In accordance with Federal Executive Order 11990, entitled "Protection of Wetlands," EPA has determined that there may be unavoidable adverse impacts to wetlands and aquatic resources. To the extent that federally regulated wetlands and aquatic resources are located within and adjacent to the Ore Pad, Mine Operations Area, Waste Rock Pile-3, the Tailings Impoundment, or the contaminated portions of Goose Pond and the adjacent salt marsh, these wetlands may be removed and/or altered as part of the cleanup actions. All material removed from these area will be disposed of into the CAD cell, located in the submerged former mine pit. Due to the depth (over 300 feet) and size of the pit, as well as the hypoxic state of the water within the pit, the pit's use as a permanent disposal site will not impair wetland and aquatic resources within Goose Pond. Wherever possible, wetland areas will be restored. EPA has evaluated the requirements of the applicable regulations, including Section 404 of the Clean Water Act and identified the selected remedy as the least damaging practicable alternative to protect federally regulated wetland and aquatic resources from exposure to contaminated sediments and contaminated surface water. In its Proposed Plan, EPA solicited public comment on the alteration of wetlands during the course of the proposed remediation. Based upon public comment and EPA's review of wetland restoration, compensation, and mitigation standards, EPA will include the dredging of approximately 1.5 subtidal acres of Goose Cove and 3.6 subtidal acres of Dyer Cove to remove mine wastes that had been historically disposed of into these water-bodies as a result of mining operations as a wetland mitigation component of the remedy. The dredged mine waste will be disposed of into the CAD cell.

EPA has made a finding under the Toxic Substances Control Act (TSCA) PCB Regulations at 40 C.F.R. § 761.61(c), that the cleanup level of 1 ppm established for PCBs at this Site will not pose an unreasonable risk of injury to health or the environment.

G. ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this Record of Decision. Additional information can be found in the Administrative Record file for this Site.

1. Chemicals of concern (COCs) and their respective concentrations.

2. Baseline risk represented by the COCs.

3. Cleanup levels established for COCs and the basis for the levels.

4. How source materials constituting principal threats are addressed.

5. Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD.

6. Potential land and groundwater use that will be available at the Site as a result of the selected remedy.

7. Estimated capital, operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected.

8. Key factor(s) that led to selecting the remedy (i.e., a description of how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria under the NCP, highlighting criteria key to the decision).

H. AUTHORIZING SIGNATURES

Issuance of this ROD embodies the determination made by the Director of the Office of Site Remediation and Restoration, pursuant to the Toxic Substances Control Act, that that the cleanup level of 1 ppm established for PCBs at this Site will not pose unreasonable risk to human health or the environment pursuant to 40 C.F.R. § 761.61 (c).

This ROD documents the selected remedy for OU1 at the Callahan Mine Superfund Site. The State of Maine Department of Environmental Protection (the Maine DEP) concurs with the remedy.

Concur and recommended for immediate implementation:

U.S. Environmental Protection Agency

By: _____ Date: 9-30-09
James T. Owens III, Director
Office of Site Remediation and Restoration
EPA New England, Region 1

RECORD OF DECISION SUMMARY

A. SITE NAME, LOCATION AND BRIEF DESCRIPTION

Callahan Mine Superfund Site
Brooksville, Hancock County, Maine
MED980524128
Site ID No: 0101028
Operable Unit 1

The Callahan Mine Superfund Site (Site) is located in the village of Harborside in the Town of Brooksville, Maine. The Site is located on the northwest side of the Cape Rosier peninsula on Penobscot Bay and is approximately 15 miles west of the Town of Blue Hill and 35 miles west of the Town of Bar Harbor. The former Callahan Mine was operated as an open-pit zinc/copper mine and was perhaps the only intertidal mine in the world during the time that it operated. The mining operation and facilities were developed adjacent to and beneath the Goose Pond tidal estuary. The Site includes: the 120-acre former Callahan Mine property, which includes the former industrial operations area, a series of waste rock piles, and a tailings impoundment; Goose Pond, which includes Dyer Cove, the submerged former Mine Pit, Stink Cove, and the wetlands within Goose Pond; Goose Cove; and the Residential Use Area. The waste rock piles and operational areas are for the most part unvegetated and barren. In addition to the four seasonal homes on Old Mine Lane in the Residential Use Area of the Site, private residences and seasonal homes are located adjacent to the former Callahan Mine property on Goose Falls Road and Cape Rosier Road. The Holbrook Island Sanctuary State Park is immediately east of the Site. Site coordinates are 44° 21' 05.9" north latitude and 68° 48' 35.5" west longitude. The location of the Callahan Mine and the study area subject to investigation as part of the Remedial Investigation is shown on Figure 1.

A more complete description of the Site can be found in Section 1 of the OU1 Remedial Investigation (RI) Report and Section 1 of the OU1 Feasibility Study (FS) Report.

B. SITE HISTORY AND ENFORCEMENT ACTIVITIES

1. History of Site Activities

Mining for copper and zinc began at the Site in 1880 when an outcrop of massive zinc and copper ore was discovered in Goose Pond at low tide. That year Shaft #1 was advanced approximately 400 feet along the strike of the ore body. Shafts #2 and #3 were advanced the following year. These early shafts are shown in Figure 2. Between 1881 and 1883, about 10,000 tons of ore were mined. The ore reportedly contained 20 percent zinc, 2.8 percent copper, and some lead. Sporadic mining continued from 1883-87 when the mine closed because of low metal prices. Intermittent exploration continued at the Site through the 1950s, although little mining occurred. In 1956, the mine property was optioned by the Penobscot Mining Company, Ltd., of Toronto. The Penobscot Mining Company drilled a few exploratory boreholes, cleaned

out the old workings, and mined some ore from underground shafts and tunnels. Mining soon ceased because of a decline in metal prices and lack of funds.

In 1964, the mine property was brought to the attention of Callahan Mining Corporation (Callahan). Historical tunnel mining at the Site had proved uneconomical. Re-evaluation of past work and Callahan's own investigations indicated that sufficient values might exist to warrant an open-pit mining operation. Based on this analysis, Callahan negotiated a lease with the Penobscot Mining Company in 1964 and subsequently acquired the shoreline property. In order to operate an open-pit mine, a portion of which was within the limits of Goose Pond, from 1968 to 1972, Callahan first obtained a variety of government leases, legislation, and permits, including:

- A mining lease with the Maine Mining Bureau (Mining Lease No. 5, dated December 15, 1967) that provided royalty payments to the State for minerals extracted from State land;
- The passage of a special act by the Maine Legislature in 1966 (P&S 1965, Chapter 243) to acquire the riparian rights to all lands bordering Goose Pond in order to drain the pond for mineral extraction;
- A permit from the U.S. Army Corps of Engineers in 1966 to construct two dams, one at Goose Falls to prevent inflow of sea water and one upstream of the mine to prevent inflow of fresh water;
- A permit from the Maine Department of Transportation to construct a dam under the bridge at Goose Falls; and
- A permit from Maine's Water Control Board (or Water Improvement Commission) in 1966 authorizing Callahan to discharge effluent from the flotation operation into Goose Cove (Penobscot Bay).

Callahan began pre-construction activities at the mine in 1965 with ditch digging to control water flow and site work at the Mine Operations Area. Dam construction to enable draining of Goose Pond was completed in 1966, and a $4 million ore processing facility was completed. Open-pit mining operations commenced on February 17, 1968. When the pit reached a depth of approximately 100 feet, mining operations were interrupted when approximately 225,000 tons of mud flowed into the pit from Stink Cove leaving a 33-foot thick layer of organic silt covering some excavation equipment. Callahan spent six months removing silt and disposing it at Waste Rock Pile-1 (WRP-1). When mining operations ceased in 1972, the mine consisted of a roughly circular open pit approximately 600 feet in diameter and 320 feet deep. Figure 2 shows historical mine features and facilities present during the time of active mining, and Figure 3 is an aerial photograph from a 1972 newspaper article showing the open pit excavation and dewatered Goose Pond.

A more detailed description of the Site history can be found in Section 1 of the OU1 RI Report.

2. History of Federal and State Investigations and Removal and Remedial Actions

Prior to the Site's NPL listing, the State performed several investigations at the Site in 1974, 1975, 1987, 1995, and 1999. A study completed by the Maine Department of Marine Resources in 1975 examined bioaccumulation of trace elements in selected marine organisms located in Goose Cove. Levels of cadmium, copper, lead, and zinc were detected at several times to several orders of magnitude higher in Goose Cove biota and sediments than in samples collected from other Maine mid-coastal and river locations. Maine DEP conducted sampling in 1999. Soil samples, tailings pond samples, tailings pile samples, waste rock pile samples, sediment samples, and surface water samples were collected. The analytical results for these samples were used to associate hazardous substances with their sources and attribute hazardous substances to the Site. The Site's National Priorities List (NPL) listing relied in part on Maine's prior investigations.

The Site was proposed for the NPL on September 13, 2001 (F.R. Vol. 66, No. 178, pages 47612-47618). The Site was finalized on the NPL on September 5, 2002 (F.R. Vol. 67, No. 172, pages 56757-56765). The extent of EPA activities at the Site include the: OU1 remedial investigation/feasibility study (RI/FS); ongoing OU2 RI/FS; an OU2 Early Action to establish Institutional Controls within the mine property to prevent groundwater use and residential development; and the upcoming remedial action for OU1 being undertaken in accordance with Section 104 of CERCLA and described in this ROD.

Prior to EPA's involvement, limited reclamation and remedial work were performed. A reclamation program was performed by Callahan after the mining and milling operations ceased in 1972. The reclamation activities included:

- Draining of surface water from the tailings pond and seeding surface;
- Grading, seeding, and planting of the waste piles;
- Berms constructed around the open pit were blasted/pushed into the pit. Other structures such as roads and other earthworks were re-graded so as to not protrude from the surface of the re-established Goose Pond;
- Partial removal of the upstream freshwater dam and re-establishing Marsh Creek flow to Goose Pond;
- Flooding of the pit and Goose Pond by removing the sluice boards in the Goose Falls dam;
- Salvaging and reselling of mining and processing equipment;
- Partially demolishing buildings and equipment foundations;

The seeding and plantings on the waste rock piles and the Tailings Pile were largely unsuccessful due to lack of suitable soil in these areas. At that time there were no State standards requiring reclamation of mine sites. The current State law requiring full reclamation and environmental cleanup, the Maine Metallic Mineral Exploration, Advanced Explorations, and Mining regulation at 06-096 CMR Chapter 200, was not in existence when the mine was closed.

In addition to the EPA activities, four underground storage tanks (USTs) that were located near the metal shop were removed from the Site in 1987. The USTs were removed by a contractor working for the property owner under the oversight of Maine DEP. The action was documented in a Maine DEP Oil and Hazardous Material Response Form, B-241-97.

EPA began the RI/FS at the Site in 2004. In 2005, EPA signed an Administrative Order by Consent (AOC) to allow the State of Maine to complete the RI/FS. The Maine Department of Transportation ("Maine DOT") was identified by the State as the State entity to implement the requirements of the AOC to complete the RI/FS. Maine DOT retained MACTEC Engineering and Consulting, Inc. (MACTEC) for the performance of the RI/FS. The AOC remains in effect until the RI/FS for the final operable unit (expected to be for OU2) is complete at the Site.

The key findings of the OU1 RI/FS are presented in Section E of this ROD. The OU1 RI/FS was completed prior to the issuance of the Proposed Plan for this ROD in July 2009. The OU2 RI/FS is ongoing.

3. History of CERCLA Enforcement Activities

EPA has identified the following potentially responsible parties (PRPs) under CERCLA at the Site: Callahan Mining Corporation, as a former owner and operator; the State of Maine, as a former and current owner; and Smith Cove Preservation Trust as a current owner. As described in the section above, the State has been performing the RI/FS with EPA oversight under the AOC. EPA continues to evaluate the viability of these parties with respect to the performance of the remedial action. EPA will continue to investigate whether other viable PRPs for the Site may be identified.

C. COMMUNITY PARTICIPATION

The OU1 Remedial Investigation Report was made available to the community in April 2009. The OU1 Feasibility Study and Proposed Plan for the Site were made available in July 2009. These documents, and others relating to the Site, can be found in the Administrative Record file which is available at the information repositories: Brooksville Library and EPA Record Center in Boston, MA. The notice of the availability of the OU1 RI/FS, Proposed Plan, and Administrative Record was published in the Bangor Daily News on June 27, 2009 and in the Ellsworth American on July 2, 2009. A public comment period was held from July 10 to August 10, 2009. An extension to the public comment period was requested. As a result, the comment period was extended by 30 days to September 10, 2009. EPA met with the community, as discussed below, from April 2005 to June 2009 to update the community regarding the investigations and finding of the OU1 RI/FS. In addition, EPA held a public meeting on July 9, 2009 to present the OU1 Proposed Plan to the community. Notice of the June 9, 2009 meeting and OU1 Proposed Plan was also included in general articles in the Bangor Daily News and Ellsworth American on June 29, 2009 with follow up articles indicating the date of the public hearing and extension of comment period on July 11 in the Bangor Daily News and July 16 in the Ellsworth American. EPA also provided notice of the public information meeting and public

hearing to over 600 people by mail and sent over 600 copies of the OU1 Proposed Plan by mail and posted the OU1 Proposed Plan on the EPA website for the Callahan Mine Superfund Site.

Throughout the EPA cleanup of the Site, community concern and involvement have been high. EPA has met with the community on a regular basis to provide an update on EPA activities and seek community input. A Technical Assistance Grant (TAG) was provided in 2003 to provide independent technical support for the community. EPA has met regularly with the TAG consultant, and the TAG consultant has reviewed and provided comments on the OU1 RI/FS Reports and Proposed Plan.

In developing this ROD, specific public involvement activities have included:

- EPA released a public information fact sheet and met with the community in 2002 to discuss the placement of the Site on the NPL and the plans for the RI/FS;
- Meetings between EPA and the local community to discuss the implementation and findings of the OU1 RI/FS were held in: April 2005, Aug 2005, July 2006, Aug 2007, May 2008, July 2008, April 2009, and June 2009;
- EPA released public information fact sheets to update the OU1 RI/FS activities in April 2005, July 2005, June 2006, August 2007, and April 2009;
- EPA released a fact sheet summarizing the OU1 RI in April 2009;
- EPA met with the community to discuss the OU1 RI in April 2009 and met with the community to discuss the FS and proposed cleanup for OU1 in June 2009;
- EPA held a public information meeting to present the OU1 RI/FS and Proposed Plan on July 9, 2009;
- The OU1 Proposed Plan was released to the public in July 2009;
- EPA provided a public comment period from July 10, 2009 to September 10, 2009 to accept public comments regarding the OU1 Proposed Plan;
- As part of the public comment period, EPA held a public hearing on August 6, 2009 to accept public comment regarding the OU1 Proposed Plan (prior to the hearing, EPA provided the public with access to a panel of experts to answer questions relating to the Site and proposed cleanup activities); and
- EPA's response to the comments received during the comment period is included in the Responsiveness Summary, which is Appendix C to this ROD. The comments received as part of the public comment period were generally supportive of the proposed cleanup action.

To further support community involvement, EPA met with the community in May and July 2008 to seek community input regarding the long-term use of the Site. A document entitled "Reuse Assessment for the Callahan Mine Superfund Site" was released in April 2009 as an outcome of the community feedback from the meetings in 2008. In addition, significant efforts were made to take into consideration community input regarding roads, traffic, and future Site use as part of the development of the FS.

D. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

The cleanup action presented in this ROD will be the first cleanup action for the Callahan Mine Superfund Site. EPA often implements a cleanup action in phases or "Operable Units." This allows for a focus on the portions of the Site where more immediate risk reduction is necessary and can provide more time to better understand other areas of the Site. For the Callahan Mine Superfund Site, EPA is creating two Operable Units. Operable Unit 1 (OU1) will target the following threats to human health and the environment:

- Soil and waste contaminated with PCBs;
- Soil and waste that represent the most significant threat to surface water, sediments, and groundwater (Ore Pad, Mine Operations Area, Waste Rock Pile 3, and Tailing Impoundment);
- Areas of sediment that were shown to be acutely toxic and represent a food chain threat (Southern Goose Pond and adjacent salt marsh); and
- Soil and waste contaminated with lead and arsenic in areas with current residential use.

The OU1 areas are shown in Figure 4.

Operable Unit 2 (OU2) will address all other areas and media at the Site where risks to human health or the environment are present that are not addressed by OU1. In addition to the OU1 Remedial Action described in this ROD, an Early Action has been initiated for OU2. The OU2 Early Action addresses the future potential threat from ingestion of groundwater and direct contact with contaminated soil/waste within the former Callahan Mine property portion of the Site. A current State ban on the harvesting of clams, oysters, and mussels in Goose Pond and Goose Cove has also been incorporated into the OU2 remedy as part of the OU2 Early Action until such time as any risks to human health from consumption of these species is assessed through the OU2 ROD.

The OU2 Early Action includes the implementation of land use restrictions on the former Callahan Mine property portion of the Site to:

- Prevent the installation of water supply wells; and
- Prevent residential development.

The OU2 Early Action described in more detail in a separate decision document that is included in the Administrative Record for this ROD. The area where institutional controls for groundwater and soils will be implemented as part of Early Action for OU2 is shown in Figure 5. All of the waters of Goose Pond and the area where mine waste is present in Goose Cove are subject to the State harvest ban.[1]

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[1] The State ban covers a more extensive area of the coast throughout the area due to general pollution concerns. The restrictions due to Site contamination, which have been incorporated into the OU2 Early Action, are limited to the portions of the Callahan Mine Superfund Site described above.

The remaining components of OU2 will address Site-wide groundwater and soil contamination, as well as the potential risks posed from the consumption of clams, oysters, and mussels. OU2 will also evaluate whether the contamination of two adjacent water supply wells is related to the Site. OU2 will also evaluate the success of OU1 to determine whether any additional actions are necessary to address any remaining risks posed by surface water and sediment after implantation of the OU1 remedy. The OU1 Remedial Investigation Report, including the Human Health Risk Assessment (HHRA) and Baseline Ecological Risk Assessment (BERA), evaluated the entire study area for both OU1 and OU2. A supplemental Remedial Investigation Report and revised HHRA and BERA reports may be developed for OU2 if the information collected prior to the completion of the OU2 RI/FS suggests that such a revision is necessary.

The only principal threat waste identified at the Site is the PCB contamination that is located in a small area within the former Mine Operations Area. The PCB concentrations are more than two orders of magnitude greater than the Site specific cleanup level. The PCB contaminated soil and waste will be excavated and removed from the Site. EPA will evaluate whether any of the PCB waste requires off-site treatment prior to disposal. The remaining mine waste at the Site is considered low level threat waste for because this waste does not represent a direct contact or incidental ingestion threat based on current Site land use and this waste represents a long-term leaching threat to surface water and groundwater that can be reliably contained through a combination of engineering controls and administrative controls, including containment, land-use restrictions, and natural processes, along with some limited treatment in some areas.

E. SITE CHARACTERISTICS

Chapter 1 of the OU1 Feasibility Study Report contains an overview of the OU1 RI. The significant findings of the OU1 Remedial Investigation Report are summarized below.

1. General Characteristics

EPA performed a series of investigations to develop an understanding of the nature and extent of contamination at the Site. Table 1 lists the major investigation activities that were performed as part of the OU1 RI/FS. A brief summary of the area wide characteristics is presented followed by a more specific discussion of the Site source areas along with the nature and extent of contamination. Only the media and areas that relate to the OU1 remedial action are discussed in this ROD. The information pertaining to other media and areas of the Site can be found in the OU1 Remedial Investigation Report, which is part of the Administrative Record.

Table 1
Summary of Major Investigations for OU1 RI at the Site

Year of Investigation	Principal Investigator/ Investigation Description	Sampling Summary
2004	USEPA - TRC Initial Remedial Investigation	30 surface soil samples
		12 surface water samples and 1 seep sample
		23 sediment samples
		Bathymetry survey of Goose Cove and Goose Pond
		Geophysical surveys to map bedrock
2005	Maine DOT - MACTEC Phase 1A 2005 Remedial Investigation	189 surface soil samples
		15 surface water samples and 13 seep samples
		564 sediment samples
		41 ecological sample locations
2006	Maine DOT - MACTEC Phase 1A 2006 Remedial Investigation	22 soil borings
		16 piezocone penetrations
		5 piezometers
		14 overburden monitoring wells, 10 bedrock monitoring wells
		1 round residential drinking water sampling
		2 rounds groundwater sampling and 2 synoptic groundwater level surveys
		4 air monitoring stations
		Electromagnetic surveys
		15 seep samples
		7 surface water samples
2007	Maine DOT - MACTEC Phase 1B 2007 Remedial Investigation	12 soil borings
		10 piezometers
		9 overburden monitoring wells,4 bedrock monitoring wells
		44 test pit excavations
		1 round groundwater sampling and1 synoptic groundwater level survey
		1 round residential drinking water sampling
		9-month water elevation monitoring
		5 seep samples
		325 surface soil samples
		103 sediment samples
		55 subsurface soil samples
		6 surface water samples
2008	Maine DOT - MACTEC Clam Tissue/Sediment Bioavailability Study	22 clam tissue samples
		22 sediment samples

The OU1 RI evaluated the Site in several categories, each with sub-areas. The categories and subareas, which are listed in Table 2 and shown in Figure 6, include:

- Source areas: The source areas are the waste rock and tailings resulting from the mining activities along with the former operational areas. The OU1 RI evaluated the following source areas:
    - Waste Rock Pile 1 (WRP-1)
    - Waste Rock Pile 2 (WRP-2)

  - Waste Rock Pile 3 (WRP-3)
  - Ore Pad
  - Tailings Impoundment
  - Mine Operations Area
  - Site access roads
  - Dyer Point
  - Dyer Cove Perimeter
- Halo areas: Areas surrounding the source areas that may have been impacted as a result of wind blown dust or other physical transport.
- Aquatic Habitats: Goose Cove and Goose Pond, including the surface water, sediment, biota, and adjacent wetlands.
- Residential Use Areas: Areas where Site-related waste is located which are subject to current residential use.
- Groundwater: Groundwater at the Site and impacted groundwater off-site.

Table 2
Size and volumes of Terrestrial Source Areas, Residential Use Area, and Former Mine Pit

Site Areas	Estimated Dimensions and Volumes			
	Average Thickness, ft	Area, sq feet	Area, acres	Volume, yards^3
OU1 Areas Waste Rock and Tailings				
Mine Operations	5.2	227,000	5.2	44,000
Ore Pad	4.8	90,000	2.1	16,000
Residential Area	2.0	72,000	1.7	5,000
OU1 portion of Road to Waste Rock Pile 3 *	14.6	111,000	2.6	60,000
Waste Rock Pile 3	20.5	286,000	6.6	216,000
Tailings Impoundment (footprint including rock berm)	21.1	916,000	21.0	716,000
Volume of OU1 Areas				1,049,410
OU2 Areas Waste Rock and Tailings				
Dyer Cove Perimeter	10.0	340,000	7.8	126,000
Dyer Point	5.7	181,000	4.2	38,000
Halo Area - West Property Boundary	1.0	249,000	5.7	9,000
Stink Cove Sediment at Waste Rock Pile 1	41.7	188,000	4.3	290,000
OU2 portion of Road to Waste Rock Pile 3 *				15,000
Waste Rock Pile 1 (including berm) *	42.7	613,000	14.1	969,000
Waste Rock Pile 2 *	6.5	94,000	2.2	23,000
Volume of OU2 Areas				1,462,590
Total Waste Rock and Tailings			79	**2,512,000**
Tailings Impoundment Surface Inside of Berm	-	576,000	13.2	-
Submerged Former Mine Pit Volume 0-310'	310	467,000	11	1,712,000

Notes: * Waste Rock Pile 1 values exclusive of Stink Cove sediment
Only 75% (45,000 yd^3) of the Road to Waste Rock Pile 3 is included in OU1 volume
The portion of Waste Rock Pile 2 between the Mine Operations Area and Ore Pad is include in OU1 volume estimate (7.410 yd^3)

Four sources areas (WRP-3, Ore Pad, Mine Operations Area, Tailings Impoundment), the sediment of the aquatic habitats, and the Residential Use Area are included in the OU1 response action described in this ROD. The remaining areas will be addressed by OU2.

a. Regional Bedrock Geology

The Callahan Mine's massive sulfide deposit occurs as lenses of mixed sulfides of zinc (sphalerite), copper (chalcopyrite), lead (galena), and iron (pyrite) in close association with highly sheared and altered agglomerate. The cover of glacial till averages only a few feet in thickness and bedrock outcrops are numerous, especially along the shores. The contact between the volcanics and the southwestern end of a late Paleozoic batholith of granite and diorite is located four miles east of the Site. In the immediate vicinity of the mine, two agglomerates, the Goose Falls and Dyer Point, and a black rhyolite are recognized.

Traces of mineralization (i.e., presence of copper, lead, and zinc sulfides) at the surface are rare, but subsurface drilling established a mineralized zone that coincides approximately with the zone of intensely sheared and thoroughly altered agglomerate lying chiefly below and to a lesser extent between the diorite sills. Within the mineralized zone defined by the sheared altered agglomerate (fragmental pyroclastics, including tuffs and breccias) with disseminated sulfides, there occurred several sphalerite-chalcopyrite-galena ore shoots of lens-like habit. The largest of these massive sulfide bodies was in the thickest part of the mineralized zone, in the vicinity of Shafts 1 and 2. In this area, three ore lenses occurred beneath and were essentially conformable in dip with the lower diorite. These lenses were separated by a very lean (low grade) mineralized zone.

General stratigraphy at the Site consists of a variable thickness of mine waste fill composed of material ranging from processed fine sand, silt, and clay-sized particles (tailings) at the Tailings Impoundment, to a thick fill unit composed of large waste rock cobbles and boulders at WRP-1, more weathered pyritic waste rock material at WRP-3, a thin veneer of waste rock at WRP-2, and road fill in parts of the Mine Operations Area. The waste rock material and tailings are typically underlain by a glaciomarine clay unit, a thin layer of glacial till, and bedrock.

Bedrock is generally composed of very fine grained felsic rhyolite (felsite), banded rhyolite, and andesite flows and pyroclastics, which include finer grained tuffs to coarser agglomerates. Most bedrock encountered contained trace to low percentages of disseminated pyrite.

b. Regional Surface Water Hydrology

The principal surface water feature at the Site is Goose Pond, a tidal estuary that empties to Penobscot Bay via Goose Falls and Goose Cove. Goose Pond is bordered along its western shore by uplands formed by Dyer Hill and is largely occupied by the former Callahan Mine property. The uplands range from heavily forested woodland to barren waste rock piles and soil, and bedrock exposures. The heavily forested uplands of the Holbrook Island Sanctuary bound

the eastern shore of Goose Pond. The Goose Pond watershed encompasses approximately 5.14 million square meters, or approximately 1,270 acres.

Goose Pond occupies approximately 75 acres and had a maximum depth of approximately 30 feet prior to development of the mine. Maximum depth is now approximately 13 feet, except at the location of the former mine pit where the depth is approximately 300 feet. Freshwater enters Goose Pond from Marsh Creek, surface water runoff, seeps located at the base of waste rock piles and the Tailings Impoundment, and groundwater discharge. Figure 7 shows the surface water run-off pathways and location of the seeps identified during the OU1 RI.

In addition to Goose Pond, several small surface water bodies exist at the Site. These include a small surface water body on the Tailings Impoundment. The depth of water here varies seasonally and was observed to be less than one foot in May 2005. Three small surface water bodies were mapped in the wetland area located in the lower tier of WRP-1 (area where Stink Cove silt/clay was placed) and range from 1 to 2 feet in depth.

Overland flow of surface water typically develops rapidly at the Site during steady rainfall events and downpours, resulting in large volumes of surface runoff being directed to Goose Pond and Dyer Cove by drainage features at the Site. These drainage features are ephemeral streams, running only when there are large amounts of runoff. Subsection 3.3 of the OU1 Remedial Investigation Report provides additional discussion pertaining to surface water runoff and contaminant transport at the Site.

c. Site Hydrogeology

Sand and gravel aquifers have not been identified on the Cape Rosier Peninsula. Residences on the peninsula are served by private wells. Evaluation of the water level measurements and elevation data indicates that ground water occurs primarily in the bedrock with overburden groundwater occurring in a localized area in the Mine Operations Area. The existence of a permanent naturally saturated overburden occurs only at the Mine Operations Area where a thick wedge of till and marine sediments occurs between a rocky ridge to the west and WRP-1 to the east. This wedge of sediments receives discharge from the bedrock aquifer, as noted by artesian conditions at MW-610R, and storm water runoff from the surrounding topographic highs. A small intermittent stream flows through the Mine Operations Area as a result of the groundwater discharge and surface water runoff and infiltrates into the coarse waste rock at the northern and eastern end of the Mine Operations Area, ultimately discharging to Dyer Cove. The overburden water (impoundment water) that occurs at the Tailings Pile is a result of the construction of an earthen berm built of waste rock material which was reportedly lined, or chinked, with clay or till. The impoundment water that currently occurs within the Tailings Pile impoundment is perched above the natural groundwater surface which is approximated by the groundwater elevations measured in MW-604R and MW- 722R, which are roughly 30 and 15 feet respectively below the level of the impoundment water.

Overburden water at the WRPs and the Ore Pad areas generally occurs intermittently and with a limited saturated thickness. The overburden water in these areas appears to result from

storm water runoff infiltrating through the mine waste fill and forming areas of leachate perched on the underlying clay and till layers. This subsurface water is considered to be a leachate and not a naturally occurring, and continuously connected overburden groundwater system.

2. Nature and Extent of Contamination

The overall contamination profile for the Site includes a small hot spot with PCBs and wide-spread contamination resulting from the processing of the ore. The ore contaminants are inorganics, especially arsenic, cadmium, copper, lead, and zinc. Soil, groundwater, seeps, surface water, sediments, and biota all contain levels of several of these contaminants at levels above background.

As described above, the OU1 RI identified several subareas at the Site to facilitate the collection, evaluation, and presentation of data. Since waste rock is nearly contiguous throughout the Waste Rock Piles, the horizontal limits for each Waste Rock Pile, including the Ore Pad and Mine Operations Area, were defined during the OU1 RI by the physical features to identify each subarea. Factors used to identify the subareas included historical use, geology, nature of contamination, and exposure pathways. The subareas are shown on Figure 6 and are described in more detail in the OU1 Remedial Investigation Report. Of these areas, the four source areas that are the focus of OU1 along with the Residential Use Area and sediment of Goose Pond and Goose Cove will be described in more detail below. These four source areas are: Ore Pad, Mine Operations Area, Waste Rock Pile 3, and Tailings Impoundment.

a. Nature and Extent of Contamination in OU1 Source Areas:

i. Ore Pad

The Ore Pad is where ore was stockpiled prior to crushing and milling. The unlined Ore Pad covers approximately 2.1 acres and contains an estimated 16,000 cubic yards of waste rock. Fragments of ore and mineralized rock are visible over much of the Ore Pad. Because the Ore Pad was the location where the higher grade (higher concentration) ore was stored, this area contains some of the highest concentrations of contaminants at the Site.

In addition to zinc, copper, and lead sulfide ore fragments, the soils in this area also have a considerable number of blue and blue-green mineral fragments and rarer whitish mineral coating that may have been supergene ore minerals (copper, lead, and zinc carbonates and sulfates), or hydrated copper sulfates and soluble sulfate salts produced from more recent weathering of material remaining on the Ore Pad.

The waste rock fill at the Ore Pad is relatively thin, consisting of 2 to 3 feet of waste rock that is mixed together with the till at the till contact. The till varies in thickness up to 11 feet. Bedrock was encountered at depths ranging from 9 to 15 feet below ground surface (bgs). The Ore Pad has some of the most highly oxidized surface soils containing mineralized waste rock and ore observed at the Site. Figure 10 shows a cross section of the Ore Pad.

The Ore Pad represents the most significant threat to groundwater at the Site. Figures 8 and 9 of this ROD show the overburden and bedrock contamination for the source areas along with the groundwater flow contours. Table 3 of this ROD shows the maximum concentration for several contaminants detected in the groundwater, and Table 4 of this ROD shows the maximum levels detected in seeps near the source areas along with the estimated contaminant load by area. Table 5 shows the contaminant concentrations in the soil/waste for the Ore Pad. The Ore Pad has the highest concentrations of cadmium in the overburden (1,180 ug/l) and bedrock (160 ug/l). These levels are substantially higher than the 5 ug/l drinking water standard. The seeps from the combined Ore Pad and Mine Operations Area contain cadmium, copper, and zinc well above National Recommended Water Quality Criteria (NRWQC) and represent a significant load of cadmium and zinc to Dyer Cove. There are no other sources upgradient of the Ore Pad. Therefore, the Ore Pad is the source of this contamination. The Ore Pad is also considered to be a likely source of a significant portion of the cadmium and zinc load that discharges to Dyer Cove.

Table 3
Maximum Concentrations
Leachate and Groundwater Contamination for Source Areas

	Cadmium (µg/L)	Copper (µg/L)	Lead (µg/L)	Manganese (µg/L)	Zinc (µg/L)
Federal Primary Drinking Water Standard	5	1,300	15	na	na
State Maximum Exposure Guidelines	3.5	1,300	10	500	2,000
Water Quality Standard (NRWQC)	9	3	8	na	81
EPA Health Advisory	na	na	na	300	na
Leachate and Overburden Groundwater					
OU1 Source Areas					
Tailings Impoundment	0.2	10	4	**7,500**	2410
WRP-3	10	82	48	668	1420
Ore Pad	**1,180**	13	8	1,820	**83,600**
Mine Operations Area	**58**	132	nd	2,710	**7,460**
Overburden Groundwater and Seeps					
OU2 Source Areas					
WRP-2	na	na	na	na	na
WRP-1, Dyer Point Perimeter, Dyer point	32	171	405	776	2,710
Bedrock Groundwater					
OU1 Source Areas					
Tailings Impoundment	nd	nd	nd	1,000	9
WRP-3	na	na	Na	na	na
Ore Pad	**165**	**13,800**	3	817	**42,600**
Mine Operations Area	**30**	68	nd	2,740	**12,500**
Bedrock Groundwater					
OU2 Source Areas					
WRP-2 (downgradient of Ore Pad)	14	nd	nd	1,470	906
WRP-1, WRP-2, Dyer Point Perimeter, Dyer Point	16	6	13	**9,510**	4,120
Background (Bedrock)	3	84	nd	74	717

Notes: ug/l is micrograms per kilogram or parts per billion
Shaded areas highlight locations with significant levels of particular contaminants. The Ore Pad and Mine Operations area appear to be the most significant source areas for cadmium, copper, and zinc contamination.
Only filter groundwater results are presented. See Table 4.5-1 thru 4.5-3 of the OU1 RI for all of the groundwater sampling results

Table 4
Maximum Concentrations
Seeps from Waste Areas and Estimated Loading

Site Area	Cadmium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)
National Recommended Water Quality Criteria	9	3	8	81
OU1 Source Areas				
Tailings Impoundment	51	40	2.5	10,600
WRP-3	770	11,100	172	172,900
Mine Operations Area/Ore Pad	79	90	3.4	14,500
OU2 Source Areas				
WRP-1, WRP-2, Dyer Point Perimeter, Dyer Point	33.7	982	nd	7,860
Estimated Loading (kg/day)				
Dyer Cove (Mine Ops and Ore Pad)	0.00497	0.02884	0.00616	1.00611
WRP-1	0.00012	0.00243	0.00003	0.03113
WRP-3	0.00379	0.08817	0.00212	0.83491
Tailings Impoundment	0.00421	0.04169	0.01373	1.24135

ug/l: micrograms per liter (parts per billion)
kg/d: kilograms per day
Shaded areas highlight locations with significant levels of particular contaminants or load.
Loading values are the average of the April 2007, October 2006, and March 2007 data shown in Tables 4.4-3a thru 4.4-3b of the OU1 RI. WRP-3 and the Tailings Impoundment account for 61% of the cadmium, 81% of the copper, 72% of the lead, and 67% of the zinc load based on the RI data. The other OU1 source areas contribute to Dyer Cove which accounts for 38% of the cadmium, 18% of the copper, 28% of the lead, and 32% of the zinc.

Table 5
Summary Statistics for Ore Pad Surface Soil
- Arsenic, Cadmium, Copper, Lead, and Zinc

Analyte	Background Concentration (mg/kg)	Frequency of Detection	Range of Detected Concentrations (mg/kg) Min		Max	Average Concentration (mg/kg)	Percent > Background
Arsenic	14	2/2	46	-	50	48	100
Cadmium	0.15	2/2	0.37	-	24	12	100
Copper	11	2/2	6,600	-	14,000	10,300	100
Lead	37	2/2	350	-	1,600	975	100
Zinc	89	2/2	110	-	8,800	4,455	100

Notes:
All concentrations in milligrams per kilogram (mg/kg).
Statistics based on off-site Inductively coupled plasma mass spectrometry (ICP-MS) analyses for metals.
Average calculations use half the detection limit for non-detects.
Background concentration is based on off-site 95-percent upper tolerance level (UTL)
Source: OU1 Remedial Investigation Report, April 2009, Subsection 4.1

ii. Mine Operations Area

The Mine Operations Area is the former location of the machinery that was used to mill and process the ore that was staged in the Ore Pad. The Mine Operations Area covers approximately 5.2 acres and contains an estimated 44,000 cubic yards of waste rock. Four underground fuel storage tanks were located in this area, but these were removed in 1987 under the oversight of the Maine DEP. The Mine Operations Area included a machine shop, and assay laboratory, the two rock crushers, and the concentrator building. All of these structures have been removed from the Site; except for some of the building foundations and breached walls of the concentrator building.

The Mine Operations Area is underlain by variable thicknesses of waste rock fill and native soil consisting of clay and silt overlying glacial till. The overburden thickness varies greatly from 12.5 feet to as much as 82 feet. In general, a thin layer (2 to 3 feet) of sandy and gravelly fill overlies the fine grained stratified clay and silt. In the absence of the clay and silt, the gravelly, sandy fill extends to bedrock (12.5 feet) near the former flotation building (near SB-614). The clay and silt varies in thickness from 10 to 31 feet across the Site. Up to 72 feet of till was encountered at SB-610, indicating the presence of a narrow and deep channel between the northern and southern ridges that dominated the pre-mine topography of the Site. Figure 11 shows a cross-section of the Mine Operations Area.

The Mine Operations Area is adjacent to the Ore Pad and is also a source of groundwater contamination and cadmium and zinc loading to Dyer Cove as shown in Figures 8 and 9 along with Tables 3 and 4. As shown in Figures 8 and 9, the Mine Operations Area is downgradient of the Ore Pad; therefore, some of the groundwater and surface water contamination in this area could be contributed by the Ore Pad.

In addition to the presence of waste rock contributing to groundwater and surface water contamination, PCBs were detected in the Mine Operations Area. The presence of PCBs in the

Mine Operations Area may be related to former transformers located near the southern portion of the Primary and Secondary Crusher buildings. A 10- by 20-foot buried concrete pad was identified just north of SS-7207 at the location of SS-7221. The pad may have served as a transformer location serving the Secondary Crusher building. Very high concentrations of PCBs in surface soils suggest direct discharge of transformer oils to the ground surface. The highest concentration of PCBs was 7,900 mg/kg, which is well above acceptable levels for even short term exposure. Figure 12 shows the concentration of PCBs detected and the extent of the PCB contamination. The estimated volume of the PCBs over 1 mg/kg is 2,200 cubic yards, with an estimated 220 cubic yards over 50 mg/kg.

Petroleum contamination was also detected in the Mine Operations Area. This contamination is commingled with the CERCLA waste and will need to be managed as part of the selected remedy. Two test pits completed in the Mine Operations Area showed the presence of oily soils. Oil stained subsurface soils were exposed in TP-7119 and TP-7124. TP-7124 was excavated in what is interpreted to be a tank grave associated with underground storage tanks (USTs) reportedly removed in 1987. Oil stained silt and clay materials were observed extending from 3 to 6 feet bgs. The sample collected at 3 feet bgs showed the presence of diesel range organics (DRO) and gasoline range organics (GRO) at concentrations of 13,000 mg/kg and 390 mg/kg, respectively. TP-7119 was excavated downgradient of the tank grave depression. Oil stained soils were observed at the interface between waste rock and the underlying silty clay at 9 feet bgs. The sample collected at 9 feet bgs showed the presence DRO and GRO at concentrations of 4,900 mg/kg and 160 mg/kg, respectively. The presence of these DRO and GRO is likely associated with fuel storage and dispensing. The Maine DEP has classified the DRO/GRO contamination in the Mine Operations Area as meeting the criteria of a Stringent site according to the Maine Hydrocarbon Spill Decision Tree. Figure 12 shows the estimated extent of the petroleum contamination. There is an estimated 600 cubic yards of petroleum contamination mixed with the mine waste. Table 6 summarizes the results of the soil samples collected in the Mine Operations Area.

Table 6
Summary Statistics for Mine Operations Area Surface Soil – PCBs, Arsenic, Cadmium, Copper, Lead, and Zinc

Analyte	Background Concentration (mg/kg)	Frequency of Detection	Range of Detected Concentrations (mg/kg) Min		Max	Average Concentration (mg/kg)	Percent > Background
Aroclor-1242	NC	9/34	0.051	-	7,900	245	NC
Aroclor-1248	NC	13/34	0.16	-	1,800	59	NC
Arsenic	15	7/7	34	-	99	62	100
Cadmium	NC	6/7	43	-	98	58	NC
Copper	99	7/7	1,900	-	21,000	7,543	100
Lead	124	7/7	520	-	3,000	1,613	100
Zinc	177	7/7	12,000	-	64,000	28,714	100

Notes:
All concentrations in mg/kg.
Statistics based on off-site analysis for PCBs and on-site X-ray Flourescence (XRF) analysis for metals.
Average calculations use half the detection limit for non-detects.
Background concentration is based on on-site analysis 95-percent UTL.
NC = not calculated
Source: OU1 Remedial Investigation Report, April 2009, Subsection 4.1

iii. Waste Rock Pile 3

WRP-3 is located between WRP-1 and the Tailings Impoundment. This waste rock pile covers approximately 6.6 acres and contains an estimated 216,000 cubic yards of waste rock. WRP-3 has abundant sulfide waste rock with conspicuous iron staining (limonite) along its top and eastern slope. WRP-3 is referred to in some historic records as a "prior tailings pile," though no tailings were encountered during drilling of this area. Dead and stressed vegetation occurs along the base of WRP-3 and near an area where a copper-rich, blue-green seep discharges to Goose Pond (identified in the Baseline Ecological Risk Assessment [BERA] as an area of readily apparent harm). The U.S. Geological Survey (USGS) collected samples of the gray to light brown and blue-green precipitates from SP-509 and has determined the presence of gypsum ($CaSO_4*2H_2O$) and glaucocerinite, a hydrated copper aluminum sulfate ($Cu_4Al_2(SO_4)(OH)_{12}*3H_2O$), in addition to other detrital minerals including quartz and chlorite.

Borings installed in WRP-3 encountered 40 feet of waste rock in the southern end and 19 feet in the northern end. Up to 11 feet of till is present over bedrock which was encountered at 51 feet bgs. Prior seismic and GPR data indicated that depth to bedrock is up to 60 feet bgs. Waste rock core from within the top twenty feet contained pyritic rhyolite and abundant limonite staining and strongly weathered rock fragments. Surface soils at WRP-3 are the most visibly stained at the Site. Pyritic rhyolite and mineralized waste rock cover almost 80 percent of the surface area of WRP-3 including abundant fragments of talc-carbonate host rock. Figure 13 shows a cross section of WRP-3.

WRP-3 was not identified as a significant source of groundwater contamination because there is a very limited saturated thickness within WRP-3 and the majority of the infiltration is believed to exit at the seeps along the base of WRP-3. As shown in Table 5, these seeps contain the highest concentrations of cadmium, copper, and zinc at the Site. As stated above, there are

areas of dead vegetation at the locations of these seeps. Summary statistics for the soil/waste within WRP-3 are shown in Table 7.

Table 7
Summary Statistics for Waste Rock Pile 3 Surface Soil – Arsenic, Cadmium, Copper, Lead, and Zinc

Analyte	Background Concentration (mg/kg)	Frequency of Detection	Range of Detected Concentrations (mg/kg)			Average Concentration (mg/kg)	Percent > Background
			Min		Max		
Arsenic	14	2/2	23	-	130	77	100
Cadmium	0.15	2/2	0.78	-	0.79	1	100
Copper	11	2/2	340	-	3,600	1,970	100
Lead	37	2/2	240	-	700	470	100
Zinc	89	2/2	400	-	420	410	100

Notes:
All concentrations in mg/kg.
Statistics based on off-site (ICP-MS) analyses for metals.
Average calculations use half the detection limit for non-detects.
Background concentration is based on off-site 95-percent UTL
Source: OU1 Remedial Investigation Report, April 2009, Subsection 4.1

iv. Tailings Impoundment

The Tailings Impoundment covers approximately 21 acres and contains an estimated 716,000 cubic yards of tailings and waste rock. Anecdotal information gathered during the OU1 RI indicates that the berm encompassing the Tailings Impoundment was constructed in multiple stages (i.e., lifts). This type/method of construction is commonly termed a "raised embankment" (Vick, 1990). Typically, the first lift (i.e., a "starter dike") is constructed of natural soil borrow or available fill materials and is sized (vertically) to accommodate the first year or two of the mill's tailings output, with necessary/appropriate allowances for storage of surface water and/or flood inflows.

Reportedly, the Tailings Impoundment had an engineered structure to remove water from inside the impoundment and discharge it under the berm. A drainage pipe was found at the western edge of the Tailings Impoundment. Based on geophysical surveys and dye tracer testing the pipe was determined to discharge at a previously mapped seep (SP-511) at the base of the tailings impoundment berm. The pipe currently drains impounded surface water from the Tailings Impoundment when surface water elevations rise as a result of precipitation and/or snowmelt events. In addition, runoff from the Tailings Impoundment drains through a low area in the berm at the northwest corner of the Tailings Impoundment and into an overland drainage swale between the Tailings Impoundment and WRP-3

During mine operations, tailings were pumped into the impoundment through spigots along pipes that were placed around the periphery of the berm. Sand to silt/clay sized tailings settled out of the water. Filling of the impoundment in this manner resulted in coarser grained tailings settling near the edges of the berm structure while finer grained particles (slimes) settled out in the central portion of the Tailings Impoundment. The central portion of the Tailings

Impoundment contains a gentle depression due to settlement that parallels the long axis of the impoundment. The oval shaped depression typically holds surface water throughout the summer months and a cattail marsh has developed. The remaining portion of the Tailings Impoundment surface is unvegetated.

Waste rock types in the tailings impoundment berm are primarily agglomerate, andesite, pyritic rhyolite and black rhyolite. Trace amounts of mineralized waste rock are observed. Current data indicate that the Tailings Impoundment consists of 11 to 56 feet of tailings materials (i.e., angular stratified sands and silts) underlain by a native clay layer ranging in thickness from approximately three to 16 feet. The Tailings Impoundment thickens to the east, and the clay layer thins to the east. Test pit data indicate the toe of the tailings impoundment berm rest directly on the underlying clay and does not appear to be keyed into this unit. Underlying the clay is a thin layer of silty glacial till which overlies bedrock. Boring data within the Tailings Impoundment indicate that the top of bedrock is encountered at from 32 to 75 feet bgs. The bedrock surface slopes downward to the east toward Goose Pond. The depth to groundwater ranges from 1 to 28 feet bgs, deepening to the east towards Goose Pond. Groundwater flows east towards the estuary. Approximately 60 percent of the tailings are located below the water table. Figure 14 shows a cross section of the Tailings Impoundment.

The Tailings Impoundment contains an artificial aquifer resulting from the slow drainage of the water within the tailings. Manganese was the contaminant detected at high concentrations in the groundwater. As shown in Table 4, the Tailings Impoundment seeps are a major source of cadmium, copper, and zinc that is being discharge to Goose Pond. In addition, the salt marsh adjacent to the Tailings Impoundment along with the portions of Goose Pond adjacent to the Tailings Impoundment contain tailings with copper, lead, and zinc well above levels acceptable for ecological receptors. The Tailings Impoundment is an ongoing and historical source of the sediment contaminant in the salt marsh and Goose Pond.

During the OU1 RI, 22 samples were collected from the Tailings Impoundment for on-site X-ray Flourescence (XRF) analysis for metals, and 5 were collected for off-site metals analysis by Inductively coupled plasma mass spectrometry (ICP-MS). Summary statistics for the XRF analytical results are shown in Table 8. XRF data are shown because they represent a larger data set than the ICP-MS data.

Table 8
Summary Statistics for Tailings Impoundment Surface Soil – Arsenic, Cadmium, Copper, Lead, and Zinc

Analyte	Background Concentration (mg/kg)	Frequency of Detection	Range of Detected Concentrations (mg/kg) Min		Max	Average Concentration (mg/kg)	Percent > Background
Arsenic	15	22/22	28	-	160	63	100
Cadmium	NC	4/22	44	-	56	26	NC
Copper	99	22/22	1,000	-	4,000	2,764	100
Lead	124	22/22	230	-	1,400	946	100
Zinc	177	22/22	3,200	-	22,000	7,355	100

Notes:
All concentrations in mg/kg.
Statistics based on on-site XRF analyses for metals.
Average calculations use half the detection limit for non-detects.
Background concentration is based on on-site analysis 95-percent UTL.
NC = not calculated.
Source: OU1 Remedial Investigation Report, April 2009, Subsection 4.1

v. Geotechnical Evaluation of the Waste Rock Piles and Tailings Impoundment

Following the data collection activities in 2006 and 2007, slope stability evaluations were carried out for the Tailings Impoundment, WRP-1, and WRP-3 utilizing SLOPE/W (GeoStudio 2004, Version 6.22). The objectives of these evaluations were to assess the static, pseudo-static, and/or post-earthquake factors of safety (FOS) relative to global stability, based on the existing site-specific conditions. Effective stress (i.e., long-term condition) stability analyses were performed using the Spencer method. Multiple "runs" were evaluated for each area of the Site, considering both circular (i.e., rotational) and wedge-type (i.e., sliding block) failure surfaces. The consultant for Maine DOT, MACTEC, issued a Geotechnical Evaluation Report in January of 2009. The report documented the 2006 and 2007 geotechnical data collection activities and presented static and seismic slope stability evaluations of the Tailings Impoundment, WRP-1, and WRP-3, based on existing site conditions. Typical requirements for a long-term FOS are 1.5 for critical structures, such as Tailings Impoundments. The results are summarized as follows:

Tailings Impoundment. The estimated long-term static FOS is on the order of 1.1 to 1.2. The results also indicate that the FOS following a design magnitude 5.5 earthquake would range from about 0.85 to 0.95.

WRP-3. The estimated long-term static FOS is 1.15 to 1.20. The pseudo-static FOS is estimated to be 1.00 to 1.05, and the post-earthquake FOS is on the order of 1.10 to 1.15.

The Tailings Impoundment and WRP-3 do not meet typical geotechnical stability FOS or the 1.5 long-term FOS required by State of Maine regulations for mine waste piles, including tailings impoundments. As a result, any remediation strategies for these two areas would need to account for the stabilization of the waste.

b. Nature and Extent of Contamination in Residential Use Area Soil

As part of the investigation of the areas surrounding the source areas (referred to as the Halo Area in the OU1 Remedial Investigation Report), the OU1 RI included surface soil sampling in residential areas bordering the northern portion of the former Callahan Mine property along Old Mine Lane and Harborside Road. These samples were used to assess whether surface soils had been affected by fugitive dust and/or contaminated fill. Samples were also collected from the private water supply wells at these locations. The groundwater is being addressed as part of the OU2 RI.

During the OU1 RI, 50 residential area soil samples were collected for on-site XRF analysis for metals, and 6 were collected for off-site metals analysis by ICP-MS. The results for field XRF metals analyses are summarized in OU1 Remedial Investigation Report, Appendix R, and results for ICP-MS metals analysis are summarized in OU1 Remedial Investigation Report, Table 4.1-11. Summary statistics for the XRF analytical results are shown in Table 9. XRF data are shown because they represent a larger data set than the ICP-MS data.

The OU1 RI identified mine waste as fill in Old Mine Lane. Three properties adjacent to Old Mine Lane were found to have levels of arsenic and lead above background levels and Site specific risk levels. Figure 15 shows the extent of the arsenic, lead, and thallium contamination.

Table 9
Summary Statistics for Residential Area Surface Soil
- Arsenic, Cadmium, Copper, Lead, and Zinc

Analyte	Background Concentration (mg/kg)	Frequency of Detection	Range of Detected Concentrations (mg/kg) Min		Max	Average Concentration (mg/kg)	Percent > Background
Arsenic	15	38/50	10	-	86	24	52
Cadmium	NC	2/50	37	-	39	21	NC
Copper	99	41/50	25	-	1,400	297	46
Lead	124	48/50	22	-	1,500	395	58
Zinc	177	50/50	59	-	11,000	1,706	68

Notes:
All concentrations in mg/kg.
Statistics based on on-site XRF analyses for metals.
Average calculations use half the detection limit for non-detects.
Background concentration is based on on-site analysis 95-percent UTL.
NC = not calculated.
Source: OU1 Remedial Investigation Report, April 2009, Subsection 4.1

c. Nature and Distribution of Goose Pond Surface Water Contamination

Data from leachate and groundwater seeps are presented in Table 4 and shown in Figure 7. Table 4 includes water quality criteria as an evaluation for whether the groundwater may cause surface water to exceed NRWQC. The data show that the waste areas included in OU1 are the most significant contributors to the surface water contamination at the Site. Substantial dilution of the contamination occurs as the leachate mixes with the water of Goose Pond. Concentrations appear to be highest during the outgoing tide when the dilution from Goose Cove is at its lowest. WRP-3 and the Tailings Impoundment appear to be the most significant sources

of contamination in the seeps, followed by the Mine Operations Area and the Ore Pad, which discharge to Dyer Cove. It is possible that the exposed sulfide ore on the sides of the former Mine Pit may also contribute to the surface water contamination.

d. Nature and Distribution of Sediment Contamination

i. Goose Pond Sediment Contamination:

Goose Pond sediments contain a widespread distribution of metals at concentrations above risk screening values and background. The concentrations are highest in an area adjacent to WRP-3 and the Tailings Impoundment and portions of Goose Cove and Dyer Cove. These areas have been identified as the areas containing mine waste. During the OU1 RI, a total of 447 samples from Goose Pond were analyzed by field XRF screening. The results of the field XRF screening are summarized in OU1 Remedial Investigation Report, Appendix R. The 85 samples submitted for off-site metals reveal similar results and can be found in OU1 Remedial Investigation Report, Tables 4.3-4 through 4.3-9. Summary statistics for all areas of Goose Pond combined for arsenic, cadmium, copper, lead, and zinc are shown in Table 10. Samples from Dyer Cove contained the highest concentrations of cadmium (94 mg/kg) and zinc (26,000 mg/kg) and second highest concentrations of arsenic (88 mg/kg) and copper (4,700 mg/kg). The highest lead concentration of 2,700 mg/kg was detected at both Dyer Cove and in South Goose Pond (in vicinity of the Tailings Impoundment and WRP-3). Samples from the South Goose Pond area that contains mine waste also contained the highest concentrations of arsenic (95 mg/kg) and copper (5,700 mg/kg) and second highest concentrations of cadmium (82 mg/kg) and zinc (19,000 mg/kg). In contrast, relatively low concentrations of arsenic, cadmium, copper, lead, and zinc were detected in the areas of Goose Pond outside the South Goose Pond mine waste area.

Table 10
Summary Statistics for Goose Pond Sediment – All Areas
Arsenic, Cadmium, Copper, Lead, and Zinc

Analyte	Background Concentration (mg/kg)	Frequency of Detection	Range of Detected Concentrations (mg/kg) Min		Max	Number > Background	Percent > Background
Arsenic	13	360/447	10	-	95	320	72
Cadmium	0.8	20/447	40	-	67	20	4
Copper	21	251/447	20	-	5,700	239	54
Lead	35	399/447	16	-	2,700	213	48
Zinc	130	432/447	38	-	26,000	279	62

Notes:
All concentrations in mg/kg.
Statistics based on on-site XRF analyses for metals.
Background concentration based on off-site 95-percent UTL for arsenic, cadmium, and copper, and on-site XRF 95-percent UTL for lead and zinc (OU1 Remedial Investigation Report, April 2009, Subsection 4.3.1)

ii. Salt Marsh Sediment Contamination

The salt marsh includes the wetland areas between Goose Pond and the Tailings Impoundment and WRP-3, and between Marsh Creek and the adjacent upland forested areas. The salt marsh contains grasses and vegetation with small areas of standing water and small channels that convey water during tidal movements. Measurements of total organic carbon (TOC) indicate sediments in the salt marsh range from 1.8 percent to 21 percent organic carbon. There are several surface water seeps within the salt marsh area along the slope east of the Tailings Impoundment and WRP-3 that have relatively high concentrations of inorganic analytes as discussed in Subsections 2.5 and 4.4 of the OU1 Remedial Investigation Report, and there may be a drain system that connects to the Tailings Impoundment decant structure that allows migration of metals into this area. The high concentrations of metals observed in this area are likely a result of the historical and on-going discharge of seeps to the salt marsh. In addition, overflow of the Tailings Impoundment at its northwest corner and surface water runoff from WRP-3 may have contributed to salt marsh contamination.

Three areas of readily apparent harm were identified near the WRP-3 seeps. In these locations, dead vegetation, and, in some cases, discoloration of the soil surface was observed. Field XRF screening data showed some of the highest concentrations of metals in these locations. Copper and lead concentrations exceeded screening values by greater than 1.5 orders of magnitude. Zinc exceeded the screening value by greater than two orders of magnitude.

The salt marsh is subjected to on-going contamination from seep discharges. Also, the upper portion of Goose Pond periodically floods the salt marsh, which may result in the deposition of suspended sediment containing elevated metals.

The area of salt marsh south (upstream) of the mine waste area of South Goose Pond does not appear to be significantly impacted. Detected concentrations of copper, lead, and zinc in this portion of the salt marsh are consistent with screening values and background concentrations.

During the OU1 RI, a total of 140 samples from the salt marsh area were analyzed by field XRF screening. The results of the field XRF screening are summarized in OU1 Remedial Investigation Report, Appendix R. Thirty-three samples were collected from the salt marsh area and submitted to an off-site laboratory for analysis. The 33 samples submitted for off-site metals analyses showed similar results and are summarized in OU1 Remedial Investigation Report, Table 4.3-14. Summary statistics for all of the salt marsh areas sampled as part of the OU1 RI for arsenic, cadmium, copper, lead, and zinc are shown in Table 11.

Table 11
Summary Statistics for Salt Marsh Sediment
- Arsenic, Cadmium, Copper, Lead, and Zinc

Analyte	Background Concentration (mg/kg)	Frequency of Detection	Range of Detected Concentrations (mg/kg) Min		Max	Number > Background	Percent > Background
Arsenic	13	60/140	10	-	100	57	41
Cadmium	0.8	12/140	35	-	67	12	9
Copper	21	119/140	20	-	20,000	114	81
Lead	35	113/140	16	-	2,000	107	76
Zinc	130	140/140	57	-	25,000	111	79

Notes:
All concentrations in mg/kg.
Statistics based on on-site XRF analyses for metals.
Background concentration based on off-site 95-percent UTL for arsenic, cadmium, and copper, and on-site XRF 95-percent UTL for lead and zinc (OU1 Remedial Investigation Report April 2009, Subsection 4.3.1).

iii. Goose Cove Sediment Contamination

Goose Cove is a marine environment. Goose Cove receives discharges from and discharges to Goose Pond during the ebb and flow of the tides. However, during mining operations, tidal flow was blocked, and the cove received direct discharge from the mine pit dewatering system. Goose Cove sediments have some of highest concentrations of metals reported at the Site. Elevated concentrations of metals were found at locations in Goose Cove that occurred within observed mine waste in sediment. A total of 96 samples from Goose Cove were analyzed by field XRF screening. The on-site field XRF screening data showed copper, lead, and zinc at concentrations at one to over two orders of magnitude above UTL background and screening values. Arsenic was also reported in about 66 percent of the samples. The results of the field XRF screening samples are summarized in Table R-3.8 in Appendix R of the OU1 Remedial Investigation Report. Copper was detected at concentrations ranging from 21 to 8,700 mg/kg. The maximum detected concentration from sample location SD-5207 was over two orders of magnitude above the screening value and background. Lead and zinc were also detected at maximum concentrations at sample location SD-5207, at concentrations greater than two orders of magnitude above screening values. Lead was detected at a concentrations ranging from 16 to 2,000 mg/kg, and zinc was detected at concentrations ranging from 33 to 18,000 mg/kg. Field XRF screening data showed that metals concentrations are highest in the upper 1.5 feet of sediment and tend to dissipate with depth. Concentrations of metals approach background levels below 3.5 feet. In addition, elevated concentrations of metals appear to coincide with observed mine waste in sediment. TOC content in sediment ranged from less than 0.96 percent to 7.8 percent in samples collected from the Goose Cove.

Table 12
Summary Statistics for Goose Cove Sediment
- Cadmium, Copper, Lead, and Zinc

Analyte	Frequency of Detection	Range of Detected Concentrations (mg/kg)			Average of All Samples (mg/kg)
Select Metals		Min.	-	Max.	
Cadmium	23/55	0.55	-	58	17
Copper	51/55	27	-	8,700	1,573
Lead	54/55	14.9	-	2,000	382
Zinc	55/55	35	-	18,000	3,849

iv. Sediment Contamination Summary

Arsenic, cadmium, copper, lead, and zinc were found throughout Goose Pond, Goose Cove, and the salt marsh, with the highest concentration found in four areas of the Site documented to contain mine waste. Metals contamination in the sediment of Goose Pond, Goose Cove, and the salt marsh is attributed primarily to historical mine operations. Figure 2 of this ROD shows several areas of the Site were used as collection basins for either tailings or the effluent from the dewatering of the mine pit. Dyer Cove was used as a settling basin for pit dewatering after sedimentation of Goose Cove became a concern, and historical drawings indicate that South Goose Pond adjacent to WRP-3 may have been used for removal of solids from Tailings Impoundment to decant water. Overflow from the Tailings Impoundment via a drainage ditch at the northwest corner may have also contributed to Goose Pond contamination, as may have use of mineralized mine waste materials (i.e., waste rock) to build berms and roads in the dewatered Goose Pond. Highly contaminated sediments in Goose Pond are typically associated with the presence of mine waste related materials. In addition, the discharge of contaminated groundwater via seeps and subsurface discharge, transport of sediment laden storm water runoff, windblown dust are all ongoing sources of contamination. Precipitation of metals from surface water has also contributed to sediment contamination. Using the information regarding Site operations and the data summarized in Table 13, four "Mine Waste Hot Spots" were identified:

- Goose Pond mine waste hot spot. This 10-acre area within the 75-acre Goose Pond is adjacent to WRP-3 and the Tailings Impoundment. Mine waste, particularly tailings, has accumulated in the sediments in this area.
- Salt Marsh mine waste hot spot. These 7 acres of salt marsh within the 23 acres of salt marsh at the Site are co-located with the Goose Pond mine waste hot spot and are also likely contaminated as result of tailings deposition.
- Dyer Cove. Dyer Cove is an 8-acre area in Goose Pond that was used as a settling basin for the sediment pumped out of the mine pit during operation. The distribution of contamination in this area is more variable than at other areas.

- Goose Cove mine waste hot spot. This 1.5-acre area of the 4-acre Goose Cove is associated with the discharge from a pipe that was used to dewater the mine pit during operation of the mine.

Table 13
Summary Statistics for Goose Pond Sediment Off-Site Analytical Results – Cadmium, Copper, Lead, and Zinc

Analyte	PRG (mg/kg) (see note below)	South Goose Pond Mine Waste Area (mg/kg)	Salt Marsh Mine Waste Area (mg/kg)	Salt Marsh without Mine Waste (mg/kg)	Dyer Cove (mg/kg)	Goose Pond without Mine Waste (mg/kg)	Goose Cove Without Mine Waste (mg/kg)	Goose Cove Mine Waste Area (mg/kg)
Cadmium	210	29.0	45.1	17.9	18.6	8.8	4.7	19.6
Copper	790	2,288	7,498	296	2,316	464	524	3,370
Lead	710	1,110	837	303	457	200	133	622
Zinc	5,100	9,601	17,161	1,773	15,835	1,979	1,111	6,607

Notes:
- PRG – Preliminary Remediation Goal. The PRGs for copper and lead in Table 13 are based on the lowest observed adverse effect level (LOAEL) derived from the Site specific food chain models. The PRG for zinc is based upon the toxicity tests for benthic organisms and was set based on acute (mortality) effects. The PRGs are the same as the sediment cleanup levels in Table 58 of this ROD.
- Shaded areas show concentrations that are well above Site specific PRGs and indicate the presence of mine waste.
- The copper and zinc best delineate the presence of mine waste. The South Goose Pond and Salt Marsh Mine Waste Areas are adjacent to WRP-3 and the Tailings Impoundment. An area of mine waste is also found in Dyer Cove and Goose Cove.

These areas are shown in Figure 4 as the highlighted areas of Goose Pond, Goose Cove, and the salt marsh. The remaining areas of the Site were then designated as:

- Goose Pond outside hot spot, which represents the remaining 57 acres of Goose Pond.
- Goose Cove outside hot spot, which represents the remaining 2.5 acres of Goose Cove.
- Salt marsh outside hot spot, which represents the remaining 16 acres of salt marsh.

e. Wetland Delineation

A wetland delineation survey was performed as part of the OU1 FS. The objective of the survey was to identify and delineate Maine DEP Protected Natural Resources and Federal jurisdictional wetlands at the Site. The wetland delineation survey included salt marsh/tidal wetlands, freshwater wetlands, and streams, and a review of potential vernal pools.

The area of investigation included Goose Pond from the outlet to Goose Cove to the upper marsh where the pond transitions to Marsh Creek. The area of investigation associated with Goose Pond ended at the point where an old beaver dam bisects Marsh Creek. The area of investigation also included the portion of the property within 250 feet of on-site areas where remediation activities may occur. The wetland delineation included flagging the upland-wetland boundary and locating wetland flags using a differentially corrected global positioning system. The wetland delineation also included a survey of the property for potential vernal pools.

Six wetland features (i.e., Wetlands A, B, C, D, E, and GP) were identified and delineated. An area of ponded water in a closed depression within Wetland A at the western edge of the Mine Operations Area was identified as a potential vernal pool. Because of the time of year when the field work was conducted (i.e., outside the spring amphibian breeding season), it was not possible to document any breeding amphibian use. Four of the wetlands delineated on Site, including Wetlands B, C, D and E, appear to have developed in areas that have been impacted by mine activities and are a direct result mine operations (i.e., man-made). Wetland B developed in an area where seeps discharging from below WRP-3 and the Tailings Impoundment were cut off from direct discharge to the Goose Pond salt marsh by an access road. Wetland C exists in a low-lying area between the toe of the Tailings Impoundment and an access road running along the edge of the salt marsh and appears to have been constructed as a drainage ditch. Wetland D formed on the top of the Tailings Impoundment, in an area that was used to pond and settle aqueous mine wastes. Wetland E formed on the top of WRP-1 in an area where Stink Cove sediments excavated from the mine pit were placed during mine operations. The wetlands along the edge of Goose Pond, including the salt marsh, are designated Wetland GP. The wetland areas at the Site are shown in Figure 4, except of Wetland GP, which is shown in Figure 22.

The Site contains both Federal and State jurisdictional wetlands. Wetland delineations may be refined during the design of the remedial action to further characterize the jurisdictional status of each wetland. The preliminary evaluation indicates that Federal jurisdictional wetlands at the Site consist of waters of the United States within Goose Pond and Goose Cove, and adjacent salt marsh areas. Freshwater Wetlands A, B, D, and E are not contiguous with waters of the United States and are not considered Federal jurisdictional wetlands, since they appear not to meet current Federal jurisdictional standards. If, after the remedial design re-evaluation, any of these wetlands are determined to be Federal jurisdictional wetlands, they may require mitigation if disturbed by the remediation. Freshwater Wetland C is a drainage ditch and is not considered a Federal jurisdictional wetland. State jurisdictional wetlands at the Site include all coastal wetlands (i.e., salt marsh and low-land areas subject to tidal action), subtidal land, and freshwater wetlands. Coastal wetlands are considered Wetlands of Special Significance under the Maine Wetlands Protection Rule (06-096 CMR 310), as are freshwater wetlands within 250 feet of coastal wetlands along the toe of the southern Tailings Impoundment berm. Freshwater Wetlands A and D were not considered State Wetlands of Special Significance. A final determination of Federal and State jurisdiction for each wetland and wetland mitigation requirements will be made during the predesign phase. Table 14 summarizes this information.

Table 14
Wetland Delineation

Wetland	Man-made	Federal Jurisdiction	State Jurisdiction
Wetland A	No	No	Yes [1]
Wetland B	Yes	No	Yes [2]
Wetland C	Yes	No	Yes [2]
Wetland D	Yes	No	Yes [1]
Wetland E	Yes	No	Yes [2]
Freshwater wetlands south of Tailings Impoundment (GP)	No	Yes	Yes [2]
Coastal wetland and tidal areas (GP)	No	Yes	Yes [2]

Note:
[1] Does not meet criteria for State Wetland of Special Significance
[2] State Wetland of Special Significance

The principal functions and values for the estuarine wetlands are fish and shellfish habitat. In addition, the estuarine salt marsh provides sediment/toxicant reduction and sediment/shoreline stabilization as a primary function/value. The Wetland Delineation and Functional Assessment Report is Appendix B to the OU1 Feasibility Study Report.

f. Sediment Transport

Goose Pond is a low-energy environment, and, based on hydrodynamic modeling, mechanical suspension of shallow sediments by wave action and currents and longitudinal transport is expected to be minimal. Goose Cove is a higher energy environment, but potential for suspension of shallow sediments by wave action and currents and longitudinal transport, while greater than in Goose Pond, remains low. Sediment resuspension by watercraft is more likely in Goose Cove than in Goose Pond.

Sediment accumulation rates in Goose Pond and Goose Cove are estimated to be 0.5 to 1 mm per year, and hundreds of years could be required to accumulate a 6- to 12-inch thick layer of clean sediment to cover contaminated material to a depth at which bioturbation would be expected to result in no significant mixing of clean and contaminated material. To assess the potential for mobilization and transport of Goose Pond and Goose Cove sediment, hydrodynamic modeling was performed as part of the OU1 RI/FS. The model evaluated the effects of Marsh Creek, tidal exchange, and storm events. Details of data and the modeling are presented in the OU1 Remedial Investigation Report.

Model simulations indicated little potential for erosion within the Goose Pond estuarine system under typical tidal and flow conditions. During a flood tide, the potential for sediment mobility (erosion) only exists in Goose Pond near the dam at Goose Falls. During an ebb tide, the reverse trend occurs where erosion potential increases within Goose Cove at Goose Falls. Therefore, under normal tidal conditions, the Goose Pond estuary will sequester most of the sediment and contaminants of concern within the system. The hydraulic jet features that were shown to occur on a typical tidal exchange between Goose Cove and Goose Pond produce bottom currents swift enough to move sediments in the immediate vicinity of the opening at

Goose Falls. Although some mobility is expected in areas where there are elevated concentrations of contaminant (e.g., upstream of the earthen dam), the potential for erosion is low, and, if mobilized, the sediment will not be transported out of the system. The typical conditions occurring at the Site indicate that a majority of the system is depositional. During normal conditions, the potential for sediment movement within Goose Pond is minimal, and it is unlikely that any sediment from Goose Pond would be transported out of the local system.

Model simulations of a 100-year precipitation event indicate that the majority of the Goose Pond estuary remains depositional, but show an increased potential for erosion of sediments within Goose Cove in the path of the hydraulic jet. However, the model simulations indicate that Goose Cove areas that may contain mine waste are for the most part outside the expected zone of erosion. There is also the potential for erosion of sediments at the former earthen dam, where the greatest current velocities were shown to exist, and upstream into Marsh Creek.

The model simulations indicate that turnover of stratified waters within the deep former mine pit is unlikely. Under normal conditions, the dense waters in the pit are confined and mixing only occurs in the upper 10 meters of the water column.

3. Conceptual Site Model

The Conceptual Site Model (CSM) is a diagram of the sources of contamination, release mechanisms and exposure pathways to receptors for the groundwater, as well as other site-specific factors. The CSM is a three-dimensional "picture" of Site conditions that illustrates contaminant sources, release mechanisms, exposure pathways, migration routes and potential human and ecological receptors. It documents current and potential future Site conditions and shows what is known about human and environmental exposure through contaminant release and migration to potential receptors. Site receptors include individuals and organisms that may come into contact with contaminated soils; ingest contaminated soil; consume the groundwater; come into contact with or ingest surface water, sediment interstitial (pore) water or sediment; or consume organisms that have accumulated contamination. The risk assessment and response action for the Site are based on this CSM as described below. Figure 16 shows the fate and transport conceptual site model and Figure 17 shows the conceptual model developed for the Site Risk Assessments.

As part of the CSM, principal threat wastes are identified. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied. Wastes generally considered to be principal threats are liquid, mobile and/or highly-toxic source material. The only principal threat waste at the Site is the PCB contaminated soil at the former Mine Operations Area.

Low-level threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. Wastes that are generally considered to be low-level threat wastes include non-mobile contaminated source material of low to moderate toxicity, surface soil containing chemicals of concern that are relatively immobile in air or ground water, low leachability contaminants, or low toxicity source material. The majority of the wastes at the Site are low-level threat wastes that are causing acid rock drainage or represent a wide spread hazard to individuals or biota.

Contaminated media at the Site include upland soil, groundwater, Goose Pond and Goose Cove sediment, waste pile seep water, and Goose Pond surface water. Major portions of the upland areas at the Site are contaminated with metals, especially arsenic, cadmium, copper, lead, and zinc. The presence and widespread distribution of these metals is attributed to spillage during transport, storage, and handling of ore and ore concentrate; disposal of tailings, disposal of waste rock, and contaminated wind-blown dust. Although much of the waste rock removed during development of the open pit was not mineralized, other sub-ore grade waste rock was mineralized with iron sulfide and lesser amounts of copper-, lead-, and zinc-bearing minerals. Use of waste rock to construct containment berms and site roads and pave/surface work areas contributed to Site contamination. The Ore pad and WRP-3 contain the highest percentages of mineralized waste rock.

The ongoing fate and transport mechanisms are shown in Figure 16. Goose Pond and Goose Cove sediments are contaminated with metals, especially copper, lead, and zinc. The highest concentrations and the largest extent of contamination is found in: 1) two areas of Goose Pond (an approximately 10.6-acre, 2,400-foot reach of southern Goose Pond extending from the southern site boundary northward past the Tailings Impoundment and WRP-3 and Dyer Cove (3.6 acres); 2) an approximately 6.9 acres of salt marsh sediments between the Tailings Impoundment and Goose Pond; and 3) an approximately 1.5-acre area in Goose Cove. PCBs and DRO/GRO contamination have not been detected in Goose Pond sediments.

The primary source of contamination to Goose Pond and Goose Cove sediments is interpreted to be historical mine operations. The area of highest contaminant concentration in Goose Cove corresponds to an area of mapped mine waste thought to result from mine pit dewatering. Four of the five high concentration areas in Goose Pond also correspond to areas of mapped mine waste. The largest area, adjacent to the Tailings Impoundment and WRP-3, has mine waste deposits up to 3 feet thick. Based on historical information, the primary source of these deposits is overflow from the Tailings Impoundment – either through the decant pipe or via an overflow ditch at the northwest corner. Overflow from the northwest corner was also a likely major source of salt marsh contamination. In addition, discharge of contaminated groundwater through seeps and weathering of waste rock via acid rock drainage, followed by surface water transport of suspended and dissolved material, likely contributed to historical sediment contamination. It is unlikely, however, that precipitation from groundwater discharge (i.e., seeps and submerged groundwater discharge) could have created the 3-foot thick deposits documented during the OU1 RI. Overflow from the Tailings Impoundment and groundwater/seep discharge continue today. At WRP-3, weathering of waste rock via acid rock drainage followed by

groundwater/seep and surface water transport of suspended and dissolved material are interpreted as historical and ongoing contributors to Goose Pond estuary.

The primary source of contamination to Dyer Cove sediments is interpreted to be use of the cove as a settling pond to remove suspended solids from mine pit water after sedimentation of Goose Cove became a concern. In addition, although data are limited, contaminated surface water runoff during and after mine operations as well as the discharge of contaminated groundwater may be historical and ongoing contributors to Dyer Cove sediment contamination.

Limited sampling of Goose Pond surface water shows elevated concentrations of several metals, especially copper and zinc which exceed NRWQC. Surface water is continually flushed through Goose Pond as a result of tidal exchange, surface water and groundwater discharge, and precipitation. The presence of elevated concentration of metals may be the result of the ongoing discharge of contaminated surface water and groundwater/seeps from the upland portion of the Site. Overburden groundwater, where it exists, and bedrock groundwater are also contaminated beneath portions of the Site, and concentrations of aluminum, antimony, arsenic, cadmium, chromium, copper, lead, manganese, nickel, sodium, and zinc often exceed Federal and State drinking water standards and/or USEPA risk levels at one or more locations. The highest concentrations in excess of Federal and State drinking water standards and/or USEPA risk levels were at detected Ore Pad, followed by the Mine Operations Area, WRP-1, and WRP-3. The presence of these metals in groundwater is attributed predominantly to release from mineralized rock as a result of leaching by acid rock drainage.

In addition, there is a relatively small area of PCB contamination attributed to historical transformer leakage as well as a relatively small area of DRO/GRO contamination attributed to leaking underground storage tanks removed in 1987. The OU1 RI documented that the PCB contamination is limited to the soil/waste and has not impacted other areas of the Site or other Site media. Both these areas are at the Mine Operations Area. A fence was recently installed by the former Callahan Mine property owner to restrict access to the area containing PCBs over 50 mg/kg. The soil at seasonal residential use areas along the mine entrance road connecting the former Callahan Mine property to Goose Falls Road is contaminated with arsenic and lead as a result of the use of mine waste as fill for the road. EPA has notified the residents of the presence of lead and arsenic in the soil at their property.

In the absence of remedial actions, acid rock drainage from mineralized rock in upland areas and tailings at the Tailings Impoundment is expected to result in leaching of metals, including copper, lead, and zinc, and contamination of groundwater and surface water runoff with dissolved-phase metals. Surface waster runoff will also continue to physically transport weathered waste rock and tailings into the wetlands and Goose Pond. Groundwater and surface water runoff will transport these metals to discharge locations in Goose Pond. Surface water will also erode friable material and transport suspended material to Goose Pond. Transport by windblown dust, thought to have been significant during mine operations, is now expected to be minor. Because of the volume of mine waste material at the Site, these release and transport mechanisms are expected to persist for decades.

F. CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

The former Callahan Mine property portion of the Site is currently abandoned and unoccupied. Access is unrestricted, and the former Callahan Mine property is used for recreation (e.g., hiking, rock collecting, and ATV riding). The remaining areas of the Site include the current Residential Use Area, where contamination was detected in the yards along Old Mine Lane, and the wetland/aquatic areas of Goose Cove, Dyer Cove, Goose Pond, and the impacted areas of salt marsh. There is no use of, or exposure to, groundwater within the former Callahan Mine property portion of the Site. There are no plans to redevelop this Site property or the neighboring upland area to the west. Although, in the absence of institutional controls, this cannot be ruled out. There are four seasonal homes in the Residential Use Area along the mine entrance road connecting the former Callahan Mine property to Goose Falls Road. Three of these residences within the Residential Use Area rely on a private bedrock wells on their property for drinking water. One of these three has a water supply well with a treatment system to remove cadmium that was detected in the well water. The fourth residence does not use the private well due to cadmium contamination and relies upon bottled water for drinking and cooking. Table 15 provides a summary of the Site use assumptions and future use after cleanup.

Recreational uses of Goose Cove and Goose Pond, including boating, also occur; however, the shallow depth of water at Goose Falls prevents passage between Goose Pond and Goose Cove by large watercraft. Commercial and recreational lobster collection occurs in Penobscot Bay and occasionally in Goose Cove. Lobstering does not occur in Goose Pond. Commercial fishing is not known to occur in Goose Cove or Goose Pond, however there have been anecdotal reports of scallop harvesting in Goose Cove. Recreational fishing occurs in Goose Cove, and may occur in Goose Pond.

The shellfish beds for clams, oysters and mussels in Goose Cove have been closed by the State. Shellfish harvesting for scallops, which are not included in the closure, has been reported by local residents. The shellfish (clam and mussel) beds of Goose Pond are also closed by the State, although there are anecdotal accounts that some harvesting may occur on a very infrequent basis. The shellfish ban is listed as Closed Area No. 36, Bagaduce River and Harborside (Castine, Penobscot, Brooksville) (DMR Chapter 95.04(C) (Appendix E). The State has placed a ban, because of pollution, on digging, taking or possessing any clams, quahogs, oysters, or mussels taken from the flats and waters of Goose Cove or Goose Pond. Based on shellfish collecting activities performed as part of the OU1 RI, clam density in Goose Pond is low, and clam harvesting is slow and difficult. Because very little mud flat is exposed at low tide in Goose Pond, clam harvesting must be performed in one or two feet of water. After the implementation of the OU1 sediment removal remedy, the OU2 RI/FS will assess whether there is any remaining CERCLA risk to human health from the consumption of banned shellfish in Goose Pond and Goose Cove.

Land use in the vicinity of the Site is rural residential and open space. The land surrounding the former mine area is mostly forested. Holbrook Island Sanctuary State Park is located across Goose Pond immediately east of the Site. Adjacent land cover types consist

mostly of mixed hardwood and softwood and softwood-dominated woodlands sloping to the shore.

Evidence of recreational and general public access to, and use of, the mine area is apparent. These areas are accessed by foot and by all-terrain vehicle (ATV) by recreational visitors to the Penobscot Bay area, and by geology enthusiasts. Area residents, sportsmen, and visitors to the Penobscot Bay area may access the adjacent forested areas by foot or by ATV. The land use of the Site is not expected to change in the future. However, development, including residential development, cannot be ruled out for the adjacent forested area which is primarily owned by one family. Area residences obtain their water supply from private water wells located on their properties, but there is no current use of the contaminated Site groundwater. Sampling of the wells in the vicinity of the Site revealed that two water supply wells contained cadmium contamination above Federal and State drinking water standards. Since the contaminants that were detected, cadmium and zinc, are found within the natural ore body, one of the objectives of the OU2 RI is to determine whether the impacts are Site-related or a result of the well being located in the same mineral formation that was the source of the ore. The State of Maine has provided a treatment system for one of the locations. The other well is not in use as potable water. The remaining wells in the area do not appear to be impacted by the Site or the ore body. A few instances of lead contamination due to plumbing were identified as a result of the residential water supply sampling.

The Goose Pond estuary is primarily a shallow impounded flowage with features of a broad tidal channel in its middle and southern sections. Flow restrictions at the inlet of the Goose Pond (from both ledge outcrop and Goose Falls Dam) drive tidal patterns, resulting in unique conditions throughout the estuary. The estuary has extreme swings in salinity and/or flow depending on lunar phase, precipitation amounts, and the period of the daily tidal cycle. At its most extreme, the southernmost portion of the Goose Pond was found to intermittently have a high proportion of its substrate drained for days at a time during the first and third quarter lunar phase. During the full and new moon periods, these same areas were inundated for several days.

Representative aquatic ecological receptors include aquatic plants, benthic macroinvertebrates, water column invertebrates, fish, semi-aquatic birds (e.g., spotted sandpiper, great blue heron, osprey, and bald eagle), and semi-aquatic mammals (e.g., river otter). Representative terrestrial receptors include invertebrates, birds (e.g., robin, red tailed hawk), and mammals (e.g., white-footed mouse and short-tailed shrew).

Community and stakeholder input was sought and incorporated through active outreach during the OU1 RI/FS. EPA held numerous meetings, held private discussions with local residents, landowners, and Town officials, and solicited the views of the Potentially Responsible Parties (PRPs).

Table 15
Current and Future Potential use of Site

	Current On-Site Use	Current Adjacent Use	Reasonable Potential Beneficial Use of Site	Basis for Potential Beneficial Use of Site	Time Frame to Achieve Potential Beneficial Use
Land **Residential Use Area**	Residential	Residential and undeveloped forest	Residential	The area has current residential use. After cleanup, the area should continue to be residential. There will not be any long-term restrictions on this portion of the Site.	For soil, upon completion of soil cleanup, the land will be able to achieve beneficial reuse. Residential drinking water will be evaluated as part of OU2.
Land **Source Areas**	Undeveloped property with recreational uses (walking, rock collecting, scenic views)	Residential and undeveloped forest	Limited passive recreational use	Current use is likely to continue as a result of OU2 Early Action institutional controls to prevent residential development and use of water. The site terrain will be altered significantly by the implementation of the OU1 remedy.	Upon removal of the PCBs from the Mine Operations Area, the major threat to a visitor from hazardous substances will be removed. OU2 will assess the need for additional soil cleanup actions.
Surface Water	Limited, some fishing, canoeing, kayaking	Same	Limited, some fishing, canoeing, kayaking	Re-use assessment and discussion with community and property owners. Physical constraints at Site.	Current use is acceptable at this time as no human health threats were identified from surface water or sediment.
Deep Groundwater – Bedrock **(no shallow groundwater use at Site)**	Residential use Area properties are served by private wells. There is no groundwater use within the source areas.	Drilled wells for water supply	OU2 will address any long-term groundwater remedial action, if required.	Drinking water use in the residential area, no groundwater use on the former Callahan Mine property	Under OU2 early action land use restriction to be established to prevent groundwater use in the former Callahan Mine property and a final groundwater remedy will be established in the OU2 ROD, which does not have a set publication date.
Biota consumption	Site waters have State prohibition on collection of clams, oysters, and mussels	Adjacent waters also have State prohibition on collection of clams, oysters, and mussels	Prohibition will likely remain if State clam, oyster, and mussel harvesting ban is also based on non-CERCLA contamination within the area. The OU1 remedial action only addresses sediments posing ecological risk. Any remnant contaminant human health CERCLA risk that remains after the OU1 sediment removal will be addressed under OU2.	Future use of the area is dependent on State review of non-CERCLA contaminant risks. Any remnant contaminant human health CERCLA risk that remains after the OU1 sediment removal will be addressed under OU2.	Current use (prohibition) will likely remain in effect for the future at least until the OU1 sediment remedy is completed and a reassessment of remaining risks can be made by both the State and EPA.

G. SUMMARY OF SITE RISKS

A baseline risk assessment for OU1 was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Site assuming no remedial action was taken. Although the baseline risk assessment for OU1 evaluated the entire Site, only the OU1 focus areas will be discussed in this ROD. The focus areas for OU1 include the current Residential Use Area of the Site; the soil/waste within the Ore Pad, Mine Operations Area (including the PCB hot spot), WRP-3, and the Tailings Impoundment; surface water; wetlands; and sediments. Soil/waste for the remaining areas of the Site, along with groundwater and shellfish consumption risks, will be addressed as part of OU2. The baseline risk assessment for OU2 will estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated the Site after the implementation of OU1.

The results of the human health risk assessment provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action. The human health and ecological risk assessments followed a four step process: (1) hazard identification, which identified those hazardous substances which, given the specifics of the Site, were of significant concern; (2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations and determined the extent of possible exposure; (3) effects assessment, which considered the types and magnitude of adverse effects associated with exposure to hazardous substances; and (4) risk characterization and uncertainty analysis, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the Site, including carcinogenic and non-carcinogenic risks and a discussion of the risk at background levels of contamination and the uncertainty in the risk estimates.

The Risk Assessments, both human health and ecological, for the Site were based on the data collected in support of the OU1 RI/FS program, including data collected during the previous investigation by USEPA in 2004, the Phase IA RI field program in 2005, and the Phase 1B RI field program in 2007. Data collected for the OU1 RI were selected for use in the HHRA using the criteria established by USEPA in "Guidance for Data Usability in Risk Assessment" (USEPA, 1992). The data presented in the OU1 RI and selected for use in the HHRA were a product of laboratory analyses performed in accordance with USEPA Region 1 methods and associated Quality Assurance/Quality Control (QA/QC) procedures, as described in the Quality Assurance Project Plan (QAPP). The majority of data for the Site were developed through the Phase IA and 1B RI field programs. The data validation process confirmed that the available data were suitable for use in risk assessment. Sample quantitation limits (SQLs) were generally below risk-based screening values (used for COPC selection), indicating that analytical methods were sensitive enough to detect concentrations that could be a potential concern from a health risk perspective. In addition, the principal contaminants at the Site are metals, and most metals were detected in nearly all the samples within each data set. Therefore, overall, detection limits do not have a substantial effect on the data sets.

A summary of those aspects of the human health risk assessment that support the need for remedial action is discussed below, followed by a summary of the environmental risk assessment. The entire Human Health Risk Assessment (HHRA) is available as part of the Administrative Record.

1. Human Health Risk Assessment

The OU1 RI and HHRA evaluated all Site media, including source area soil/waste, surface water, sediment, ambient air, biota tissue, groundwater, and residential soil. For the OU1 areas, the only pathways that were identified as an unacceptable threat were current and future exposure to residential soil and source area soil/waste. Surface water, sediment, and biota were not identified as representing a threat to human health based on the data and assumptions in the OU1 RI and HHRA. The final evaluation of groundwater across the entire Site, soil/waste outside OU1 areas, and shellfish consumption from Goose Cove and Goose Pond will be included as part of the OU2 RI and HHRA.

Fourteen of the more than 44 chemicals detected in the soil at the Site were selected for evaluation in the human health risk assessment as chemicals of potential concern for soil and waste in the source area. Eleven of the 23 chemicals identified in residential Lot A, 5 of the 23 chemicals identified in residential Lot B, eleven of the 23 chemicals identified in residential Lot C, and six of the 23 chemicals identified in residential Lot D were selected for evaluation in the human health risk assessment as chemicals of potential concern for residential soil. The chemicals of potential concern were selected to represent potential site related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment. The chemicals of concern for all Site areas can be found in Tables 1-2 thru 1-17 of the Human Health Risk Assessment of the OU1 RI. From this, a subset of the chemicals were identified in the OU1 RI/FS as presenting a significant current or future risk and are referred to as the chemicals of concern (COCs) in this ROD and summarized in Tables 16 through 20 below. These Tables contain the exposure point concentrations used to evaluate the reasonable maximum exposure scenario (RME) in the baseline risk assessment for the chemicals of concern. Estimates of average or central tendency exposure concentrations, maximum concentrations, and the 95% Upper Confidence Limit of the arithmetic mean for the chemicals of concern and all chemicals of potential concern can be found in Tables 2-09 thru 2-26 of the Human Health Risk Assessment of the OU1 RI.

Table 16
Summary of Chemicals of Concern and Medium Specific Exposure Point Concentrations Current and Future Exposure to Source Area Soil

Exposure Point	Chemical of Concern	Concentration Detected (mg/kg)		Concentration Detected (mg/kg)		Frequency of Detection	Exposure Point (EPC) Concentration	EPC units	Statistical Measure
Source Area Surface Soil		Min	Max	Avg	UCL				
	PCB (Aroclor - 1242)	0.051	7,900	231	655	11/36	655	mg/kg	95% UCL
	PCB (Aroclor-1248)	0.16	1,800	55.6	595	13/36	595	mg/kg	95% UCL
	Arsenic	6.6	220	52.1	90.8	27/27	90.8	mg/kg	95% UCL
	Lead	140	2300	826	1010	27/27	1010	mg/kg	95% UCL
	Thallium	0.22	6.7	1.3	1.8	23/27	19.3	mg/kg	95% UCL

Key:
Min: Minimum concentration
Max: Maximum concentration
Avg: Arithmetic average concentration
UCL: 95% Upper Confidence Limit on the arithmetic mean
Mg/kg: milligram per kilogram which is also parts per million

This table presents the chemicals of concern (COCs) and exposure point concentrations for each COC detected in soil (i.e., the concentration that will be used to estimate the exposure and risk from each COC in soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the Site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that arsenic, lead, and thallium were all frequently detected at the Site. The PCBs (Aroclor 1242 and 1248) were detected less frequently because they are present in a defined area "hot spot" resulting from a past spill. The 95% UCL on the arithmetic mean was used as the exposure point concentration for Aroclor 1242, Aroclor 1248, arsenic, lead, and thallium. EPA guidance allows the use of the 95% UCL or arithmetic average in evaluating lead exposure. Due to the limited data set, the 95% UCL was used as the EPC rather than the arithmetic mean.

Table 17
Summary of Chemicals of Concern and Medium Specific Exposure Point Concentrations Current and Future Exposure to Lot A Residence Soil

Exposure Point	Chemical of Concern	Concentration Detected (mg/kg)		Concentration Detected (mg/kg)		Frequency of Detection	Exposure Point (EPC) Concentration	EPC units	Statistical Measure
Surface Soil – Residential Lot A		Min	Max	Avg	UCL				
	Arsenic	14	60	34.7	45.7	9/10	45.7	mg/kg	95% UCL
	Lead	22	1100	511	747	10/10	747	mg/kg	95% UCL
	Thallium	0.21	0.42	6.4	0.51	2/10	0.42	mg/kg	Maximum detected concentration

Key:
Min: Minimum concentration
Max: Maximum concentration
Avg: Arithmetic average concentration
UCL: 95% Upper Confidence Limit on the arithmetic mean
Mg/kg: milligram per kilogram which is also parts per million

This table presents the chemicals of concern (COCs) and exposure point concentrations for each COC detected in soil for this residential lot (i.e., the concentration that will be used to estimate the exposure and risk from each COC in soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the Site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that arsenic and lead were both frequently detected at the Site. The 95% UCL on the arithmetic mean was used as the exposure point concentration for arsenic and lead EPA guidance allows the use of the 95% UCL or arithmetic average in evaluating lead exposure. Due to the limited data set, the 95% UCL was used as the EPC rather than the arithmetic mean. Due to low frequency of detection, the maximum detected concentration was used as the EPA for thallium.

Table 18
Summary of Chemicals of Concern and Medium Specific Exposure Point Concentrations Current and Future Exposure to Lot B Residence Soil

Exposure Point	Chemical of Concern	Concentration Detected (mg/kg)		Concentration Detected (mg/kg)		Frequency of Detection	Exposure Point (EPC) Concentration	EPC units	Statistical Measure
Surface Soil – Residential Lot B		Min	Max	Avg	UCL				
	Arsenic	13	34	15.6	34	3/5	34	mg/kg	Maximum detected concentration
	Lead	22	290	168	306	4/5	290	mg/kg	Maximum detected concentration

Key:
Min: Minimum concentration
Max: Maximum concentration
Avg: Arithmetic average concentration
UCL: 95% Upper Confidence Limit on the arithmetic mean
Mg/kg: milligram per kilogram which is also parts per million

This table presents the chemicals of concern (COCs) and exposure point concentrations for each COC detected in soil for this residential lot (i.e., the concentration that will be used to estimate the exposure and risk from each COC in soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the Site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that arsenic and lead were both frequently detected at the Site. The maximum detected concentration was used as the exposure point concentration for arsenic and lead due to the limited data set.

Table 19
Summary of Chemicals of Concern and Medium Specific Exposure Point Concentrations Current and Future Exposure to Lot C Residence Soil

Exposure Point	Chemical of Concern	Concentration Detected (mg/kg)		Concentration Detected (mg/kg)		Frequency of Detection	Exposure Point (EPC) Concentration	EPC units	Statistical Measure
Surface Soil – Residential Lot C		Min	Max	Avg	UCL				
	Arsenic	10	56	18	28.1	10/15	28.1	mg/kg	95% UCL
	Lead	29	1500	403	752	15/15	752	mg/kg	95% UCL
	Thallium	0.14	0.15	7.2	0.15	2/15	0.15	mg/kg	Maximum detected concentration

Key:
Min: Minimum concentration
Max: Maximum concentration
Avg: Arithmetic average concentration
UCL: 95% Upper Confidence Limit on the arithmetic mean
Mg/kg: milligram per kilogram which is also parts per million

This table presents the chemicals of concern (COCs) and exposure point concentrations for each COC detected in soil for this residential lot (i.e., the concentration that will be used to estimate the exposure and risk from each COC in soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the Site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that arsenic and lead were both frequently detected at the Site. The 95% UCL on the arithmetic mean was used as the exposure point concentration for arsenic and lead EPA guidance allows the use of the 95% UCL or arithmetic average in evaluating lead exposure. Due to the limited data set, the 95% UCL was used as the EPC rather than the arithmetic mean. Due to low frequency of detection, the maximum detected concentration was used as the EPA for thallium.

Table 20
Summary of Chemicals of Concern and
Medium Specific Exposure Point Concentrations
Current and Future Exposure to Lot D Residence Soil

Exposure Point	Chemical of Concern	Concentration Detected (mg/kg)		Concentration Detected (mg/kg)		Frequency of Detection	Exposure Point (EPC) Concentration	EPC units	Statistical Measure
Surface Soil – Residential Lot D		Min	Max	Avg	UCL				
	Arsenic	10	86	24.4	34.9	13/16	34.9	mg/kg	95% UCL
	Lead	34	1400	455	773	16/16	733	mg/kg	95% UCL
	Thallium	18	21	10.3	21	2/16	21	mg/kg	Maximum detected concentration

Key:
Min: Minimum concentration
Max: Maximum concentration
Avg: Arithmetic average concentration
UCL: 95% Upper Confidence Limit on the arithmetic mean
Mg/kg: milligram per kilogram which is also parts per million

This table presents the chemicals of concern (COCs) and exposure point concentrations for each COC detected in soil for this residential lot (i.e., the concentration that will be used to estimate the exposure and risk from each COC in soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the Site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that arsenic and lead were both frequently detected at the Site. The 95% UCL on the arithmetic mean was used as the exposure point concentration for arsenic and lead EPA guidance allows the use of the 95% UCL or arithmetic average in evaluating lead exposure. Due to the limited data set, the 95% UCL was used as the EPC rather than the arithmetic mean. Due to low frequency of detection, the maximum detected concentration was used as the EPA for thallium.

Potential human health effects associated with exposure to the chemicals of potential concern were estimated quantitatively or qualitatively through the development of several hypothetical exposure pathways. These pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the Site. The current and future potential use of the Site is discussed in Section F of this ROD.

The following is a brief summary of just the exposure pathways that were found to present a significant risk. A more thorough description of all exposure pathways evaluated in the risk assessment including estimates for an average exposure scenario, can be found in Section 2 of the Human Health Risk Assessment.

For source area soil, a current recreational use was assumed. For the recreational visitor, three age groups were defined: 1-6 years old, 7-18 years old, and 19-30 years old. Each was assumed to visit the Site 52 times per year with 200 mg per day of soil ingestion for the 1-6 year old and 100 mg of soil per day for the remaining two exposure groups.

For the source area soil, a future residential use was assumed. A current and future residential use was also assumed for four residential properties along Old Mine Lane. For the residential scenario, an adult was assumed to ingest 100 mg of soil per day for 150 days per year over a 24 year period. For a child, an ingestion rate of 200 mg of soil per day for 150 days per year over a 6 year period was assumed. For lead exposure, EPA's Integrated Exposure and Uptake Biokinetic (IEUBK) model was used to assess the potential risk to children who may be exposed to lead at the Site. The child lead model (integrated exposure uptake biokinetic model

(IEUBK); Version 1.0, Build 264) was used to assess lead exposure to children. The IEUBK model used a 350 day per year exposure frequency.

Excess lifetime cancer risks were determined for each exposure pathway by multiplying a daily intake level with the chemical specific cancer potency factor. Cancer potency factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g., 1×10^{-6} for 1/1,000,000) and indicate using this example that an average individual is not likely to have greater that a one in a million chance of developing cancer over 70 years as a result of site-related exposure (as defined) to the compound at the stated concentration. All risks estimated represent an "excess lifetime cancer risk" – or the additional cancer risk on top of that which we all face from other causes such as cigarette smoke or exposure to ultraviolet radiation from the sun. The chance of an individual developing cancer from all other (non-site related) causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for site related exposure is 10^{-4} to 10^{-6}. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances. A summary of the cancer toxicity data relevant to the chemicals of concern is presented in Table 21.

Table 21
Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal – soil

Chemical of Concern	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units	Weight of Evidence/Cancer Guideline Description	Source	Date
PCB Aroclor 1242	2	2	$(mg/Kg\text{-}day)^{-1}$	B2	IRIS *	January 2008
PCB Aroclor 1248	2	2	$(mg/Kg\text{-}day)^{-1}$	B2	IRIS *	January 2008
Arsenic	1.5	1.5	$(mg/Kg\text{-}day)^{-1}$	A	IRIS	January 2008
Lead	---	---		B2	IRIS	January 2008

Pathway: Inhalation – soil

Chemical of Concern	Unit Risk	Units	Inhalation cancer slope factor	Units	Weight of Evidence/Cancer Guideline Description	Source/Date
PCB Aroclor 1242	0.00057	$(ug/m^3)^{-1}$	2	$(mg/Kg\text{-}day)^{-1}$	B2	IRIS January 2008
PCB Aroclor 1248	0.00057	$(ug/m^3)^{-1}$	2	$(mg/Kg\text{-}day)^{-1}$	B2	IRIS January 2008
Arsenic	0.0043	$(ug/m^3)^{-1}$	15	$(mg/Kg\text{-}day)^{-1}$	A	IRIS January 2008
Lead	---	$(ug/m^3)^{-1}$	---	$(mg/Kg\text{-}day)^{-1}$	B2	IRIS January 2008

Key
— : No information available
IRIS: Integrated Risk Information System, U.S. EPA
Mg/kg: milligram per kilogram
---: Value not published
*: Based on value for PCBs

EPA Group:
A -Human carcinogen
B2 -Probable human carcinogen – Indicates sufficient evidence in animals and inadequate or no evidence in humans
C -Possible human carcinogen
D -Not classifiable as a human carcinogen
E -Evidence of noncarcinogenicity

Summary of Toxicity Assessment

This table provides carcinogenic risk information which is relevant to the contaminants of concern in soil. At this time, slope factors are not available for the dermal route of exposure. Thus, the dermal slope factors used in the assessment have been extrapolated from oral values. An adjustment factor is sometimes applied, and is dependent upon how well the chemical is absorbed via the oral route. Adjustments are particularly important for chemicals with less than 50% absorption via the ingestion route. However, adjustment is not necessary for the chemicals evaluated at this site. Therefore, the same values presented above were used as the dermal carcinogenic slope factors for these contaminants.

In assessing the potential for adverse effects other than cancer, a hazard quotient (HQ) is calculated by dividing the daily intake level by the reference dose (RfD) or other suitable benchmark. Reference doses have been developed by EPA and they represent a level to which an individual may be exposed that is not expected to result in any deleterious effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. An HQ $\leq$ 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g. liver) within or across those media to which the same individual may reasonably be exposed. An HI $\leq$ 1 indicates that toxic noncarcinogenic effects are unlikely. The Integrated Exposure and Uptake Biokinetic (IEUBK) lead model was used to evaluate the hazard potential posed by exposure of young children less than 7 years of age as the most sensitive receptor group. It is EPA policy to protect 95% of the sensitive population against blood lead levels in excess of 10 ug/dl blood. The IEUBK model used was IEUBK win v1.0 build 264. The IEUBK model was run to assess exposure to contaminated soil

using default assumptions for ingestion and concentration inputs for drinking water, air, and diet. A summary of the noncarcinogenic toxicity data relevant to the chemicals of concern is presented in Table 22.

Table 22

Non-Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Dermal RfD	Dermal RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ
Aroclor 1242	chronic	0.00002	mg/kg-day	0.00002	mg/kg-day	Immune system/ immunotoxicity	300/1	IRIS *	January 2008
Aroclor 1242	subchronic	0.00005	mg/kg-day	0.00005	mg/kg-day	Immune system/ immunotoxicity	300/1	HEAST *	FY 97
Aroclor 1248	chronic	0.00002	mg/kg-day	0.00002	mg/kg-day	Immune system/ immunotoxicity	300/1	IRIS *	January 2008
Aroclor 1248	subchronic	0.00005	mg/kg-day	0.00005	mg/kg-day	Immune system/ immunotoxicity	300/1	HEAST *	FY 97
Arsenic	chronic	0.0003	mg/kg-day	0.0003	mg/kg-day	Keratosis (skin)	3/1	IRIS	January 2008
Arsenic	subchronic	0.0003	mg/kg-day	0.0003	mg/kg-day	Keratosis (skin)	3/1	IRIS	January 2008
Lead	chronic					CNS/PNS			January 2008
Thallium	chronic	0.00008	mg/kg-day	0.00008	mg/kg-day	Liver	3000/1	IRIS	January 2008
Thallium	subchronic	0.0008	mg/kg-day	0.0008	mg/kg-day	Liver	300/1	HEAST	FY 97

Pathway: Inhalation

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC	Inhalation RfC Units	Inhalation RfD	Inhalation RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfC: RfD: Target Organ	Dates
Aroclor 1242	chronic	—	—	—	—	—	—	IRIS	January 2008
Aroclor 1248	chronic	—	—	—	—	—	—	IRIS	January 2008
Arsenic	chronic	0.00003	mg/m^3	0.0000086	mg/kg - day	Developmental, cardiovascular, CNS	—	REL	February 2005
Lead	chronic	—	—	—	—	—	—	IRIS	January 2008
Thallium	chronic	—	—	—	—	—	—	IRIS	January 2008

Key
—: No information available
IRIS: Integrated Risk Information System, U.S. EPA
HEAST – Health Effects Assessment Summary Tables
RfD: Reference Dose
Mg/kg: milligram per kilogram
REL: California Environmental Protection Agency February 2005
*: Based on value for Aroclor 1254

Summary of Toxicity Assessment: This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in soil. Four of the COCs have toxicity data indicating their potential for adverse non-carcinogenic health effects in humans. The chronic toxicity data available all four for oral exposures, have been used to develop oral reference doses (RfDs). As was the case for the carcinogenic data, dermal RfDs can be extrapolated from the oral RfDs applying an adjustment factor as appropriate. At this time, inhalation reference concentrations are only available for arsenic.

Only those exposure pathways deemed relevant to the remedy being proposed are presented in this ROD. Readers are referred to Section 4 of the HHRA in the OU1 RI for a more comprehensive risk summary of all exposure pathways evaluated for all chemicals of potential concern and for estimates of the central tendency risk. Tables 23-41 depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in soil evaluated to reflect current and potential future direct contact and incidental ingestion of contaminated soil corresponding to the reasonable maximum exposure (RME) scenario.

Table 23

Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current **Receptor Population: Recreational Visitor**
Receptor Age: Child (age 1-6 years old)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Source area soil/waste	PCB – Aroclor 1242	$2x10^{-4}$	$1x10^{-9}$	$8x10^{-5}$	-	$2.8x10^{-4}$
			PCB – Aroclor 1248	$2x10^{-4}$	$1x10^{-9}$	$8x10^{-5}$		$2.8x10^{-4}$
			Arsenic	$2x10^{-5}$	$1x10^{-9}$	$2x10^{-6}$		$2x10^{-5}$
			Lead					
							Soil Risk Total for young (1-6 year old) child	**5.8×10^{-4}**

Scenario Timeframe: Current **Receptor Population: Recreational Visitor**
Receptor Age: Child (age 7-18 years old)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Source area soil/waste	PCB – Aroclor 1242	$7x10^{-5}$	$3x10^{-9}$	$9x10^{-5}$	-	$1.6x10^{-4}$
			PCB – Aroclor 1248	$6x10^{-5}$	$2x10^{-9}$	$8x10^{-5}$		$1.4x10^{-4}$
			Arsenic	$7x10^{-6}$	$3x10^{-9}$	$2x10^{-6}$		$9x10^{-6}$
			Lead					
							Soil Risk for old child (7-18 years old)	**$3x10^{-4}$**

Scenario Timeframe: Current **Receptor Population: Recreational Visitor**
Receptor Age: Adult (age 19-30 years old)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Source area soil/waste	PCB – Aroclor 1242	$5x10^{-5}$	$1x10^{-9}$	$3x10^{-5}$	-	$8x10^{-5}$
			PCB – Aroclor 1248	$4x10^{-5}$	$2x10^{-9}$	$2x10^{-5}$		$6x10^{-5}$
			Arsenic	$4.8x10^{-6}$	$1.4x10^{-9}$	$5.7x10^{-7}$		$5x10^{-6}$
			Lead					
							Soil risk for adult	**$1.4x10^{-4}$**
							Soil risk total for adult and child=	**$1.2x10^{-3}$**

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
PCB: Polychlorinated biphenyls

Risk Characterization

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adult's exposure to ground water, as well as the toxicity of the COC (arsenic). The total risk from direct exposure to contaminated soil, including inhalation of dust, at this Site to a current recreational visitor ranges from 5.8×10^{-4} for a young child to 3×10^{-4} for an older child and 1.4×10^{-4} for an adult. A person visiting the Site as a child and adult over a thirty year period would have a carcinogenic risk of 1.2×10^{-3}. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 1.2 in 1000 of developing cancer as a result of site-related exposure to the COCs.

Table 24

Risk Characterization Summary – Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (1-6)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Source area soil/waste	PCB – Aroclor 1242	$6x10^{-4}$	$5x10^{-9}$	$2x10^{-4}$	-	$8x10^{-4}$
			PCB – Aroclor 1248	$6x10^{-4}$	$5x10^{-9}$	$2x10^{-4}$		$8x10^{-4}$
			Arsenic	$8x10^{-5}$	$7x10^{-9}$	$7x10^{-6}$		$8x10^{-5}$
			Lead					
							Soil Risk Total for young (1-6 year old) child	**2×10^{-3}**

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult (age 7-30 years old)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Source area soil/waste	PCB – Aroclor 1242	$3x10^{-4}$	$8x10^{-9}$	$1x10^{-4}$	-	$4x10^{-4}$
			PCB – Aroclor 1248	$2x10^{-4}$	$7x10^{-9}$	$1x10^{-4}$		$3x10^{-4}$
			Arsenic	$3x10^{-5}$	$8x10^{-9}$	$3x10^{-6}$		$3x10^{-5}$
			Lead					
							Soil risk for adult	**$8x10^{-4}$**
							Soil risk total for adult and child=	**$3x10^{-3}$**

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
PCB: Polychlorinated biphenyls

Risk Characterization

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adult's exposure to ground water, as well as the toxicity of the COC (arsenic). The total risk from direct exposure to contaminated soil, including inhalation of dust, at this Site to a current recreational visitor ranges from 2×10^{-3} for a young child to 8×10^{-4} for an adult. A person living on the Site as a child and adult over a thirty year period would have a carcinogenic risk of 3×10^{-3}. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 3 in 1000 of developing cancer as a result of site-related exposure to the COCs.

Table 25

Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Residential Lot A	Arsenic	$3x10^{-5}$	$4x10^{-9}$	$3x10^{-6}$		$3.3x10^{-5}$
							Soil Risk Total for young (1-6 year old) child	**$3.3x 10^{-5}$**

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Residential Lot A	Arsenic	$1x10^{-5}$	$5x10^{-9}$	$2x10^{-6}$		$1.2x10^{-5}$
							Soil Risk for Adult(7-30 years old)	$1.2x10^{-5}$
							Soil Risk for Adult and Child	**$5 x 10^{-5}$**

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
PCB: Polychlorinated biphenyls

Risk Characterization

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adult's exposure to ground water, as well as the toxicity of the COC (arsenic). The total risk from direct exposure to contaminated soil, including inhalation of dust, at this Site to a person residing on Lot A from 3.3×10^{-5} for a young child to 1.2×10^{-5} for an adult. A person living at Lot A as a child and adult over a thirty year period would have a carcinogenic risk of 5×10^{-5}. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 5 in 100,000 of developing cancer as a result of site-related exposure to the COCs.

Table 26

Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Residential Lot B	Arsenic	$2x10^{-5}$	$3x10^{-9}$	$2x10^{-6}$		$2.6x10^{-5}$
							Soil Risk Total for young (1-6 year old) child	**$2.6x\ 10^{-5}$**

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Residential Lot B	Arsenic	$1x10^{-5}$	$4x10^{-9}$	$1x10^{-6}$		$1.1x10^{-5}$
							Soil Risk for Adult(7-30 years old)	$1.1x10^{-5}$
							Soil Risk for Adult and Child	**$4\ x\ 10^{-5}$**

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
PCB: Polychlorinated biphenyls

Risk Characterization

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adult's exposure to ground water, as well as the toxicity of the COC (arsenic). The total risk from direct exposure to contaminated soil, including inhalation of dust, at this Site to a person residing on Lot B from 2.6×10^{-5} for a young child to 1.1×10^{-5} for an adult. A person living at Lot B as a child and adult over a thirty year period would have a carcinogenic risk of 4×10^{-5}. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 4 in 100,000 of developing cancer as a result of site-related exposure to the COCs.

Table 27

Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Residential Lot C	Arsenic	$2x10^{-5}$	$2x10^{-9}$	$2x10^{-6}$		$2.2x10^{-5}$
							Soil Risk Total for young (1-6 year old) child	**$2.2x\ 10^{-5}$**

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Residential Lot C	Arsenic	$8x10^{-6}$	$3x10^{-9}$	$1x10^{-6}$		$9x10^{-6}$
							Soil Risk for Adult(7-30 years old)	$9x10^{-6}$
							Soil Risk for Adult and Child	**$3\ x\ 10^{-5}$**

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
PCB: Polychlorinated biphenyls

Risk Characterization

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adult's exposure to ground water, as well as the toxicity of the COC (arsenic). The total risk from direct exposure to contaminated soil, including inhalation of dust, at this Site to a person residing on Lot C from 2.2×10^{-5} for a young child to 9×10^{-6} for an adult. A person living at Lot C as a child and adult over a thirty year period would have a carcinogenic risk of 3×10^{-5}. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 3 in 100,000 of developing cancer as a result of site-related exposure to the COCs.

Table 28

Risk Characterization Summary – Carcinogens

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Residential Lot D	Arsenic	$2x10^{-5}$	$3x10^{-9}$	$2x10^{-6}$		$2.2x10^{-5}$
							Soil Risk Total for young (1-6 year old) child	**$2.2x\ 10^{-5}$**

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Residential Lot D	Arsenic	$1x10^{-5}$	$4x10^{-9}$	$1x10^{-6}$		$1x10^{-5}$
							Soil Risk for Adult(7-30 years old)	$1x10^{-5}$
							Soil Risk for Adult and Child	**$3.2\ x\ 10^{-5}$**

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
PCB: Polychlorinated biphenyls

Risk Characterization

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adult's exposure to ground water, as well as the toxicity of the COC (arsenic). The total risk from direct exposure to contaminated soil, including inhalation of dust, at this Site to a person residing on Lot D from 2.2×10^{-5} for a young child to 1×10^{-5} for an adult. A person living at Lot D as a child and adult over a thirty year period would have a carcinogenic risk of 3×10^{-5}. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 3 in 100,000 of developing cancer as a result of site-related exposure to the COCs.

Table 29

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current
Receptor Population: Recreational Visitor
Receptor Age: Child (1-6 years old)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Source Area Soil Waste	PCB-Aroclor 1242	Immune system/ immunotoxicity	60	-	20	87
			PCB-Aroclor 1248	Immune system/ immunotoxicity	60	-	20	79
			Arsenic	Keratosis (skin)	0.6	0.0001	0.05	0.65
			Lead	CNS/PNS		-	-	
			Thallium	Liver	0.04	-	-	0.04
							Soil Hazard Index Total =	167
							Receptor Hazard Index =	167
							Maximum Tissue-Specific Hazard Index =	166

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Risk Characterization

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 160 indicates that the potential for diverse noncancer effects could occur from exposure to contaminated soil containing PCBs. The maximum tissue-specific hazard index is 166 for effects of PCBs on Immune system/ immunotoxicity . The noncancer risk from exposure to lead in soil was assessed using the IEUBK model which estimated a mean blood lead level of 2.9 ug/dl and that 0.43 percent of the population would have a blood lead level above 10 ug/dl.

Table 30

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current
Receptor Population: Recreational Visitor
Receptor Age: Older Child (7-18 years old)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Source Area Soil Waste	PCB-Aroclor 1242	Immune system/ immunotoxicity	10		10	23
			PCB-Aroclor 1248	Immune system/ immunotoxicity	9		10	21
			Arsenic	Keratosis (skin)	0.09	0.0001	0.03	0.12
			Lead	CNS/PNS				
			Thallium	Liver	0.007			0.007
							Soil Hazard Index Total =	44
							Receptor Hazard Index =	44
							Maximum Tissue-Specific Hazard Index =	44

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Risk Characterization

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 44 indicates that the potential for diverse noncancer effects could occur from exposure to contaminated soil containing PCBs. The maximum tissue-specific hazard index is 44 for effects of PCBs on Immune system/ immunotoxicity.

Table 31

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current
Receptor Population: Recreational Visitor
Receptor Age: ***Adult*** *(19-30 years old)*

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Source Area Soil Waste	PCB-Aroclor 1242	Immune system/ immunotoxicity	6.7	-	3.7	10.4
			PCB-Aroclor 1248	Immune system/ immunotoxicity	6.1	-	3.4	9.5
			Arsenic	Keratosis (skin)	0.6	0.0001	0.05	0.65
			Lead	CNS/PNS		-	-	
			Thallium	Liver	0.04	-	-	0.04
							Soil Hazard Index Total =	21
							Receptor Hazard Index =	21
							Maximum Tissue-Specific Hazard Index =	20

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Risk Characterization

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 20 indicates that the potential for diverse noncancer effects could occur from exposure to contaminated soil containing PCBs. The maximum tissue-specific hazard index is 20 for effects of PCBs on Immune system/ immunotoxicity.

Table 32

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (1-6 years old)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Source Area Soil Waste	PCB-Aroclor 1242	Immune system/ immunotoxicity	180	-	70	250
			PCB-Aroclor 1248	Immune system/ immunotoxicity	160	-	64	224
			Arsenic	Keratosis (skin)	2	0.0006	0.2	2.2
			Lead	CNS/PNS		-	-	
			Thallium	Liver	0.2	-	-	0.2
							Soil Hazard Index Total =	476
							Receptor Hazard Index =	476
							Maximum Tissue-Specific Hazard Index =	474

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Risk Characterization

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 476 indicates that the potential for diverse noncancer effects could occur from exposure to contaminated soil containing PCBs. The maximum tissue-specific hazard index is 474 for effects of PCBs on Immune system/ immunotoxicity and 2 for arsenic. The noncancer risk from exposure to lead in soil was assessed using the IEUBK model which estimated a mean blood lead level of 9.5 ug/dl and that 45.8 percent of the population would have a blood lead level above 10 ug/dl.

Table 33

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Source Area Soil Waste	PCB-Aroclor 1242	Immune system/ immunotoxicity	19	-	11	30
			PCB-Aroclor 1248	Immune system/ immunotoxicity	17	-	9	26
			Arsenic	Keratosis (skin)	0.2	0.0002	0.02	0.22
			Lead	CNS/PNS		-	-	
			Thallium	Liver	0.2	-	-	0.2
							Soil Hazard Index Total =	56
							Receptor Hazard Index =	56
							Maximum Tissue-Specific Hazard Index =	56

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Risk Characterization

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 56 indicates that the potential for diverse noncancer effects could occur from exposure to contaminated soil containing PCBs. The maximum tissue-specific hazard index is 56 for effects of PCBs on Immune system/ immunotoxicity.

Table 34

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	LotA	Arsenic	Keratosis (skin)	0.9	0.0003	0.07	0.97
			Lead	CNS/PNS				
			Thallium	Liver	0.03			0.03
							Soil Hazard Index Total =	1
							Receptor Hazard Index =	1
							Maximum Tissue-Specific Hazard Index =	1

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Risk Characterization

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 1 indicates that the potential for diverse noncancer effects could occur from exposure to contaminated soil containing arsenic. The maximum tissue-specific hazard index is 1 for effects of arsenic on skin. The noncancer risk from exposure to lead in soil was assessed using the IEUBK model which estimated a mean blood lead level of 7.7 ug/dl and that 29.2 percent of the population would have a blood lead level above 10 ug/dl.

Table 35

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Lot A	Arsenic	Keratosis (skin)	0.09	0.0004	0.01	0.1
			Lead	CNS/PNS				
			Thallium	Liver	0.003			0.03
							Soil Hazard Index Total =	0.13
							Receptor Hazard Index =	0.13
							Maximum Tissue-Specific Hazard Index =	0.1

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Risk Characterization

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. No hazard quotients exceeded one for this exposure scenario.

Table 36

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Lot B	Arsenic	Keratosis (skin)	0.6	0.0003	0.05	0.65
			Lead	CNS/PNS				
							Soil Hazard Index Total =	0.65
							Receptor Hazard Index =	0.65
							Maximum Tissue-Specific Hazard Index =	0.65

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Risk Characterization

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. No hazard quotients exceeded one for this exposure scenario. The noncancer risk from exposure to lead in soil was assessed using the IEUBK model which estimated a mean blood lead level of 4.2 ug/dl and that 3.2 percent of the population would have a blood lead level above 10 ug/dl.

Table 37

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Lot B	Arsenic	Keratosis (skin)	0.07	0.00009	0.008	0.078
			Lead	CNS/PNS				
							Soil Hazard Index Total =	0.78
							Receptor Hazard Index =	0.78
							Maximum Tissue-Specific Hazard Index =	0.78

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Risk Characterization

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. No hazard quotients exceeded one for this exposure scenario.

Table 38

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Lot C	Arsenic	Keratosis (skin)	0.5	0.0002	0.04	0.54
			Lead	CNS/PNS				
			Thallium	Liver	0.01			0.01
							Soil Hazard Index Total =	0.55
							Receptor Hazard Index =	0.55
							Maximum Tissue-Specific Hazard Index =	0.55

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Risk Characterization

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. No hazard quotients exceeded one for this exposure scenario. The noncancer risk from exposure to lead in soil was assessed using the IEUBK model which estimated a mean blood lead level of 7.8 ug/dl and that 29.5 percent of the population would have a blood lead level above 10 ug/dl.

Table 39

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Lot C	Arsenic	Keratosis (skin)	0.05	0.00008	0.007	0.057
			Lead	CNS/PNS				
							Soil Hazard Index Total =	0.057
							Receptor Hazard Index =	0.057
							Maximum Tissue-Specific Hazard Index =	0.057

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Table 40

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Lot D	Arsenic	Keratosis (skin)	0.69	0.0003	0.05	0.74
			Lead	CNS/PNS				
			Thallium		1.4		0	1.4
							Soil Hazard Index Total =	2.14
							Receptor Hazard Index =	2.14
							Maximum Tissue-Specific Hazard Index =	1.4

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Risk Characterization

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 1.4 indicates that the potential for diverse noncancer effects could occur from exposure to contaminated soil containing arsenic. The maximum tissue-specific hazard index is 1.4 for effects of thallium on the liver.. The noncancer risk from exposure to lead in soil was assessed using the IEUBK model which estimated a mean blood lead level of 7.9 ug/dl and that 30.9 percent of the population would have a blood lead level above 10 ug/dl.

Table 41

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Lot D	Arsenic	Keratosis (skin)	0.07	0.00009	0.008	0.078
			Lead	CNS/PNS				
			Thallium	Liver	0.2			0.2
							Soil Hazard Index Total =	0.257
							Receptor Hazard Index =	0.257
							Maximum Tissue-Specific Hazard Index =	0.257

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Risk Characterization

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. No hazard quotients exceeded one for this exposure scenario.

The HHRA for OU1 at the Callahan Mine identified the following areas with estimated cancer, non-cancer, and/or lead exposure risks are in excess of USEPA risk management criteria (excess lifetime cancer risk greater than 10^{-4}, hazard index (HI) greater than 1, and/or 5 percent or more of exposed population with a geometric mean blood lead level of 10 micrograms per deciliter [μg/dl] or greater) at the following areas:

- Residential Use Area lot A: Lead concentrations in soil represent an unacceptable threat under current and future residential land use.
- Residential Use Area lot C: Lead concentrations in soil represent an unacceptable threat under current and future residential land use.
- Residential Use Area lot D: Lead and thallium concentrations in soil represent an unacceptable threat under current and future residential land use.
- Former Callahan Mine property (Source Area) soil in the former Mine Operations Area: PCBs concentrations in soil represent an unacceptable threat under current recreational and future residential land use.
- Former Callahan Mine property (Source Area) soil in the former Mine Operations Area: Lead concentrations in soil represent an unacceptable threat under future residential land use.

Human health threats from exposure to groundwater, biota tissue, surface water, sediment, and soil outside the delineated OU1 areas will be addressed as part of OU2.

2. Ecological Risk Assessment

The objective of the ecological risk assessment was to identify and estimate the potential ecological impacts associated with the COCs at the Site. A Baseline Ecological Risk Assessment (BERA) was prepared to more fully evaluate the potential threats to ecological receptors using, whenever possible, multiple lines of evidence. The technical guidance for performance of the ecological risk assessment comes primarily from the following sources: Framework for Ecological Risk Assessment, Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments; and Guidelines for Ecological Risk Assessment. The OU1 BERA evaluated all Site media and exposure pathways. The OU1 response action is only focused upon the surface water and sediment, include the wetlands, and the associated biota, and those waste areas (Ore Pad, Mine Operations Area, WRP-3, and Tailings Impoundment) that are the most significant source of the surface water and sediment impacts. The OU2 RI, including BERA will address the exposure pathways relating to soil.

a. Identification of Contaminants of Concern

Contaminants of Potential Concern (COPCs) for OU1 were selected for each identified exposure area grouping within the surface water, sediment, and biota media. The COPC selection process consisted of a comparison of maximum detected analyte concentrations to conservative screening-level benchmarks and is summarized in Appendix A of the BERA. Screening benchmarks are literature-based chemical concentrations below which adverse effects are considered unlikely. Site chemicals that exceed benchmarks were retained as COPCs. Tables A2-A22 of the BERA summarizes the COPC screening process, and Table 3-9 – 3-14 of the BERA present the screening levels used for the COPC selection. The approach for selecting screening values employed the following screening criteria:

- For marine surface water: National Recommended Water Quality Criteria (USEPA, 2004) were used for screening where available; otherwise values from the National Oceanic and Atmospheric Administration's (NOAA's) Screening Quick Reference Tables (SquiRT) were used as noted.
- For surface water (fresh water): National Recommended Water Quality Criteria (USEPA, 2004) were used for screening where available; otherwise values from the National Oceanic and Atmospheric Administration's (NOAA's) Screening Quick Reference Tables (SquiRT) or Oak Ridge National Laboratory (ORNL) or Tier II Secondary Chronic Values (SCVs) were used as noted.
- For marine and estuarine sediment: Low end COPC screening benchmarks were selected using the following (listed by priority): National Oceanic and Atmospheric Administration's (NOAA's) Effects Range Low (ER-L); TC20 – which is the concentration where 20% of the samples produced a toxic effect based on USEPA, 2005 document *Predicting toxicity to amphipods from sediment chemistry. National Center for Environmental Assessment, Washington, DC; EPA/600/R-04/030*; Apparent Effects Threshold (AET); or TC50 – which is the concentration where 50% of the samples produced a toxic effect based on USEPA, 2005 document: *Predicting*

toxicity to amphipods from sediment chemistry. National Center for Environmental Assessment, Washington, DC; EPA/600/R-04/030T50. High end risk screening benchmark were selected using the following (listed by priority): NOAA Effects Range Medium (ER-M), T50, and AET.

- For freshwater sediment: Low end COPC screening benchmark were selected using the following (listed by priority): Threshold Effects Concentrations (TEC) obtained from the following: MacDonald et al., 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Arch Environmental Contaminant Toxicology 39: 20-31; ER-L; or Upper Effects Threshold (UET). High end risk screening benchmark were selected using the following (listed by priority) Probable Effects Concentration (PEC) from the document MacDonald et al., 2000, Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems.Arch Environ Contam Toxicol 39: 20-31, ER-M, UET.

Using the COPCs, sediment, surface water and tissue exposure point concentrations (EPCs) were calculated for each exposure area. Both reasonable maximum exposure (RME) and central tendency exposure (CTE) EPCs were generated. For surface water and sediment media, an RME EPC was identified as being the lesser of the 95% UCL on the arithmetic mean (95% UCL) or the maximum concentration, and CTE EPC was identified as being the lesser of the arithmetic mean or the maximum concentration. Surface water and sediment EPCs for Site samples are presented in Tables 3-1 through 3-5 of the BERA. The same procedure was used to calculate tissue EPCs for salt marsh grass (*Spartina* sp.) (Table 3-6 of the BERA) and small mammals (Table 3-7 of the BERA) as was used for surface water and sediment. Tissue EPCs for other taxa (crab, mussel, clam, marine worm, dragonfly, fish, and terrestrial invertebrates) were calculated differently because to derive 95% UCLs with their small sample sizes (usually less than 4 samples) would have introduced unquantifiable uncertainty. Instead, the RME was defined as the maximum detected concentration, and the CTE was defined as the average (arithmetic mean) concentration assuming one-half the SQL for non-detected concentrations. In the case where there was only one sample (e.g., marine worm in the Goose Pond Permanently Flooded exposure area), the detected concentration was used for both RME and CTE EPCs. EPCs for tissue data sets listed in Table 3-8 of the BERA were also the same values used to initially select COPCs and are therefore presented in Tables A-8 through A-22 in Appendix A of the BERA. RME EPCs for reference areas were based on maximum detected concentration by medium and location; 95% UCLs were not calculated because of the generally small data sets. CTE EPCs for reference areas were based on the average (arithmetic mean) by location and medium.

For OU1, only surface water and sediment, including the salt marsh, were identified as media of concern. Cadmium, copper, lead, and zinc were identified as the contaminants of concern. The summary statistics for the surface water and sediment COCs are presented below in Table 42-44 followed by Tables 45-49 with the EPCs. The BERA initially evaluated the sediment in four exposure areas. Subsequent to the completion of the BERA, a review of the historical information about the former mining operations and the OU1 RI data revealed that several sub-areas, representing locations where the mine operations resulted in the deposition of

substantial tailing or sediment, should be evaluated independently. The same data and other lines of evidence information were used as part of the OU1 FS to refine the sediment risk evaluation using this revised exposure area construct. For Goose Cove, two exposure areas were identified, rather than one (Goose Cove mine waste hot spot and Goose Cove remaining areas). For Goose Pond, three exposure areas were evaluated, rather than two (Goose Pond mine waste hot spot, Dyer Cove, Goose Cove remaining areas). For the salt marsh, two exposure areas were created, rather than one (salt marsh mine waste hot spot and salt marsh remaining areas).

Table 42
Summary of Chemicals of Concern

Surface water-estuary/marine Parameter	Frequency of Detection	Range of Detected Concentrations mg/L		Detect Location	Average mg/L	Background Conc. mg/L	Benchmark mg/L	Screening Toxicity Value Source	HQ	Selected as COC?
Metals, Total (mg/L)		Min	Max							
Cadmium	11 / 11	0.00052	0.854	SW-422	0.079	0.0004	0.0089	NRWQC - CCC	96	Yes
Copper	10 / 11	0.0121	9.79	SW-422	0.91	ND	0.0037	NRWQC	2646	Yes
Lead	9 / 11	0.0011	0.154	SW-422	0.016	ND	0.0085	NRWQC	18	Yes
Zinc	11 / 11	0.0671	169	SW-422	15.7	ND	0.086	NRWQC	1965	Yes
Metals, Dissolved (mg/L)										
Cadmium	17 / 17	0.00002	0.846	SW-422	0.051	0.0004	0.0088	NRWQC - CCC	96	Yes
Copper	16 / 17	0.0013	7.78	SW-422	0.47	ND	0.0031	NRWQC	2510	Yes
Lead	4 / 17	0.0012	0.0872	SW-422	0.0059	ND	0.0081	NRWQC	11	Yes
Zinc	15 / 17	0.05	171	SW-422	10.3	ND	0.081	NRWQC	2111	Yes

Table 43
Summary of Chemicals of Concern

Surface water-Fresh Parameter	Frequency of Detection	Range of Detected Concentrations mg/L		Detect Location	Average mg/L	Background Conc. mg/L	Benchmark mg/L	Screening Toxicity Value Source	HQ	Selected as COC?
Metals, Total (mg/L)		Min	Max							
Cadmium	43/46	0.004	0.854	SW-422	0.1	ND	0.003	NRWQC -CCC	285	Yes
Copper	42/46	0.005	11.3	SP-509	1.5	ND	0.009	NRWQC	1256	Yes
Lead	33/46	0.0009	0.178	SP-509	0.032	ND	0.003	NRWQC	59	Yes
Zinc	45/46	0.012	172	SP-509	21.6	ND	0.12	NRWQC	1433	Yes
Metals, Dissolved (mg/L)										
Cadmium	42/46	0.0037	0.846	SW-422	0.096	ND	0.003	NRWQC -CCC	282	Yes
Copper	41/46	0.0039	11.1	SP-509	1.3	ND	0.009	NRWQC	1233	Yes
Lead	22/46	0.0003	0.172	SP-509	0.016	ND	0.003	NRWQC	57	Yes
Zinc	44/46	0.1226	172	SP-509	21.3	ND	0.12	NRWQC	1433	Yes

Table 44
Summary of Chemicals of Concern

Sediment wetland/ estuary/ marine **Parameter**	**Frequency of Detection**	**Range of Detected Concentrations mg/kg**		**Detect Location**	**Average mg/kg**	**Background**	**Benchmark mg/kg**	**Screening Toxicity Value Source**	**HQ**	**Selected as COC?**
Metals		Min	Max							
Cadmium	140/141	0.09	216	GP-3	16.2	2.8	1.2	NOAA ER-L	180	Yes
Copper	141/143	6.9	29,800	GP-24	1,592	23	34	NOAA ERL	876	Yes
Lead	143/143	7.8	1,470	SD-5107	272	32	47	NOAA ERL	31	Yes
Zinc	143/143	28	61,900	GP-24	4,689	368	150	NOAA ERL	413	Yes

Table 45
Medium Specific Exposure Point Concentrations
Surface Water - Marine

Exposure Point: Surface Water - Marine		Arithmetic Mean	95% UCL	Maximum Detected Concentration	EPC	Basis for EPC
Goose Cove Surface Water	Units					
Metals, Total						
Cadmium	mg/L	0.001	NC	0.001	0.001	Maximum
Copper	mg/L	0.0214	NC	0.0214 J	0.0214	Maximum
Lead	mg/L	0.0011	NC	0.0011	0.0011	Maximum
Zinc	mg/L	0.19	NC	0.19 J	0.19	Maximum
Metals, Dissolved						
Cadmium	mg/L	0.001	NC	0.001	0.001	Maximum
Copper	mg/L	0.022	NC	0.022 J	0.022	Maximum
Zinc	mg/L	0.187	NC	0.187 J	0.187	Maximum
Goose Pond Permanently Flooded Surface Water						
Metals, Total						
Cadmium	mg/L	0.0019	0.0023	0.0027	0.0023	95% UCL
Copper	mg/L	0.02	0.042	0.0588	0.042	95% UCL
Lead	mg/L	0.0019	0.0029	0.0048 J	0.0029	95% UCL
Zinc	mg/L	0.37	0.45	0.512 J	0.45	95% UCL
Metals, Dissolved						
Cadmium	mg/L	0.0014	0.0018	0.0027	0.0018	95% UCL
Copper	mg/L	0.011	0.028	0.0547 J	0.028	95% UCL
Lead	mg/L	0.00089	0.0031	0.0044	0.0031	95% UCL
Zinc	mg/L	0.27	0.36	0.524 J	0.36	95% UCL
Goose Pond Irregularly Flooded Surface Water						
Metals, Dissolved						
Cadmium	mg/L	0.854	NC	0.854	0.854	Maximum
Copper	mg/L	9.79	NC	9.79 J	9.79	Maximum
Lead	mg/L	0.154	NC	0.154 J	0.154	Maximum
Zinc	mg/L	169	NC	169 J	169	Maximum
Metals, Dissolved						
Cadmium	mg/L	0.28	NC	0.846	0.846	Maximum
Copper	mg/L	2.6	NC	7.78 J	7.78	Maximum
Lead	mg/L	0.03	NC	0.0872	0.0872	Maximum
Zinc	mg/L	57	NC	171 J	171	Maximum

Table 46
Medium Specific Exposure Point Concentrations
Surface Water - Fresh

Exposure Point: Surface Water - Fresh	Units	Arithmetic Mean	95% UCL	Maximum Detected Concentration	EPC	Basis for EPC
Surface Water Seeps						
Metals, Total						
Cadmium	mg/L	0.12	0.36	0.854	0.36	95% UCL
Copper	mg/L	1.7	7.6	11.3	7.6	95% UCL
Lead	mg/L	0.038	0.078	0.178	0.078	95% UCL
Zinc	mg/L	25.8	76.6	172	76.6	95% UCL
Metals, Dissolved						
Cadmium	mg/L	0.12	0.36	0.846	0.36	95% UCL
Copper	mg/L	1.5	6.7	11.1	6.7	95% UCL
Lead	mg/L	0.019	0.097	0.172	0.097	95% UCL
Zinc	mg/L	25.6	77.1	172	77.1	95% UCL
Surface Water - Freshwater Metals, Total						
Cadmium	mg/L	0.061	0.15	0.246	0.15	95% UCL
Copper	mg/L	1.4	10.1	6.7	6.7	Maximum
Lead	mg/L	0.019	0.064	0.0756	0.064	95% UCL
Zinc	mg/L	13.2	73.7	54.1	54.1	Maximum
Metals, Dissolved						
Cadmium	mg/L	0.055	0.16	0.203	0.16	95% UCL
Copper	mg/L	1.1	8.3	5.9	5.9	Maximum
Lead	mg/L	0.011	0.050	0.0495	0.0495	Maximum
Zinc	mg/L	11.9	30.4	44.9	30.4	95% UCL
Surface Water –Marsh Creek						
Metals, Total						
Copper	mg/L	0.0027	NC	0.005	0.005	Maximum
Zinc	mg/L	0.011	NC	0.0149	0.0149	Maximum
Surface Water –Marsh Creek						
Metals, Dissolved						
Zinc	mg/L	0.0072	NC	0.0126	0.0126	Maximum

Table 47
Medium Specific Exposure Point Concentrations
Sediment in Goose Pond

Analyte	Frequency of Detection	Range of Detected Concentrations (mg/kg) Min Max	Average mg/kg	Site specific Protective Level mg/kg	Percent of Samples Exceeding Site specific Protective Level	95% UCL mg/kg	EPC mg/kg	Basis for EPC
Goose Pond Mine Waste Hot Spot								
Cadmium	25/69	2.6 - 82	24.8	210	0%	29.0	29.0	95% UCL
Copper	62/69	25 - 5,700	1,593	790	72%	2,288	2,288	95% UCL
Lead	74/78	17 - 2 ,700	775	710	37%	1,110	1,110	95% UCL
Zinc	68/69	76 - 19,000	5,992	5,100	64%	9,601	9,601	95% UCL
Dyer Cove Mine								
Cadmium	21/31	3.4 - 70	16.6	210	0%	18.6	18.6	95% UCL
Copper	29/31	163 - 4,980	1251	790	45%	2,316	2,316	95% UCL
Lead	36/37	26 - 1,000	288	710	8%	457	457	95% UCL
Zinc	31/31	609 - 40,000	5,888	5,100	29%	15,835	15,835	95% UCL
Goose Pond remaining areas								
Cadmium	52/130	0.5 - 46	16	210	0%	8.8	8.8	95% UCL
Copper	123/130	16 - 2,400	296	790	7%	464	464	95% UCL
Lead	133/130	8 - 710	145	710	0%	200	200	95% UCL
Zinc	130/130	68 - 12,000	1,346	5,100	4%	1,979	1,979	95% UCL

Table 48
Medium Specific Exposure Point Concentrations
Sediment in Salt Marsh

Analyte	Frequency of Detection	Range of Detected Concentrations Min Max	Average mg/kg	Site Specific Protective Level mg/kg	Percent of Samples Exceeding Site Specific Protective Level	95% UCL mg/kg	EPC mg/kg	Basis for EPC
Salt Marsh Mine Waste Hot Spot								
Cadmium	34/66	0.4- 216	36.1	210	2%	45.1	45.1	95% UCL
Copper	66/66	66 – 29,800	3393	790	82%	7,498	7,498	95% UCL
Lead	66/66	65 – 2,000	735	710	42%	837	837	95% UCL
Zinc	66/66	248 – 61,900	9081	5,100	59%	17,161	17,161	95% UCL
Salt Marsh remaining areas								
Cadmium	9/87	0.3 - 67	19.6	210	0%	17.9	17.9	95% UCL
Copper	70/89	20 - 2,500	134	790	3%	296	296	95% UCL
Lead	65/89	16 – 2, 400	133	710	3%	303	303	95% UCL
Zinc	89/89	57 – 11,000	656	5,100	3%	1,773	1,773	95% UCL

Table 49
Medium Specific Exposure Point Concentrations
Sediment in Goose Cove

Analyte	Frequency of Detection	Range of Detected Concentrations	Average mg/kg	Site specific Protective Level mg/kg	Percent of Samples Exceeding Site specific Protective Level	95% UCL mg/kg	EPC mg/kg	Basis for EPC
Goose Cove Mine Waste Hot Spot								
Cadmium	15/42	1.7- 58	20	210	0%	19.6	19.6	95% UCL
Copper	39/42	27 - 8,700	1,995	790	69%	3370	3370	95% UCL
Lead	42/42	20 – 2,000	481	710	26%	622	622	95% UCL
Zinc	42/42	35- 18,000	4,839	5,100	33%	6,607	6,607	95% UCL
Goose Cove remaining areas								
Cadmium	8/130	0.6 - 10	9	210	0%	4.7	4.7	95% UCL
Copper	12/130	52 – 1,000	214	790	8%	524	524	95% UCL
Lead	12/130	15 - 200	61	710	0%	133	133	95% UCL
Zinc	13/130	57 – 3,100	651	5100	0%	1,111	1,111	95% UCL

b. Exposure Assessment

The Goose Pond estuary is primarily a shallow impounded flowage with features of a broad tidal channel in its middle and southern sections. Flow restrictions at the inlet of the Goose Pond (from both ledge outcrop and a dam) drive tidal patterns, resulting in unique conditions throughout the estuary. The estuary has extreme swings in salinity and/or flow depending on lunar phase, precipitation amounts, and the period of the daily tidal cycle. During the 2005 Phase IA and 2007 Phase IB investigation, aquatic habitats within the Goose Pond estuary and terrestrial habitats were delineated, and habitats in reference areas were identified. Six aquatic exposure areas (Goose Cove, Goose Pond Permanently Flooded, Goose Pond Irregularly Flooded, Salt Marsh, Marsh Creek, and Weir Cove) and two terrestrial exposure areas (Source, Halo) were identified based on those habitat assessments.

Site specific data consisted of surface water, sediment (including Acid Volatile Sulfides-Simultaneously Extracted Metals (AVS SEM)), and soil chemistry data, chronic sediment toxicity test data for survival and growth effects to amphipods (*Leptocheirus plumulosus)* and marine worms (*Neanthes arenaceodentata)* (including co-located sediment and porewater chemistry), quantitative benthic and terrestrial invertebrate community survey data, and quantitative salt marsh and terrestrial plant community survey data. Site specific data also consisted of analytical data from benthic invertebrate tissue (rock crab (*Cancer irroratus*), green crab (*Cancer maenus*), clam, mussel, marine worm, and dragonfly), fish tissue (rock gunnel (*Pholis gunnelis*), mummichog (*Fundulus heteroclitus*), and common shiner), salt marsh plant tissue (*Spartina alterniflora*), terrestrial invertebrate tissue, and terrestrial small mammal tissue.

Goose Cove is a narrow, 6.3 ha (15.5 acre) inlet located adjacent to the northeastern lobe of Goose Pond, immediately north of Goose Falls. Marine worm taxa (*Neanthes virens*, *Cistenides* sp., and *Nephtys incisa*), amphipod (*Corophium* sp.), bivalves (*Mya arenaria* and *Macoma balthica*), and the sevenspine bay shrimp (*Crangon septemspinosa*) were identified in benthic grab samples. Rock crabs were also collected using baited traps. Rock gunnel and abundant green crab were observed during searches of the rocky, lower intertidal zone. Other invertebrate observations in the lower intertidal and shallow subtidal zones included green urchins (*Strongylocentotus droebachienis*), blue mussel (*Mytilis edulis*), and northern sea star (*Asterias rubens*).

Goose Pond has several ecological sub-areas as described below and shown in Figure 6. The area delineated to contain mine waste occupies a portion of both Middle Goose Pond and the Irregularly Flooded Area. The mine waste area is also referred to as Southern Goose Pond.

- North Goose Pond and Stink Cove: This 11.2 ha (27.7 acre) area is the northern (downstream) portion of Goose Pond that partially encircles the former mine pit and extends as far south as Dyer Point. The area is largely protected from wind and wave action and is exposed to only moderate fetch from the south. Depth at the area during sampling ranged from 4.92 to 14.1 feet. The intertidal zone in this sub-ecological area is characterized primarily by rocky shore and mixed fine materials. Subtidal substrates at grab sample locations ranged from coarse gravelly or sandy mud, near

Goose Falls, to fine mud elsewhere. Stink Cove appears to receive less water exchange than the other parts of this ecological area, and sediments were anoxic to the surface. Infaunal sampling conducted concurrently with sediment grabs indicated a macroinvertebrate community primarily comprised of polychaete worms (*Neanthes virens*, *Nephyts* sp., *Cistenides* sp., *Polydora* sp., and *Streblospio* sp.) and bivalves (*Mya arenaria*, *Macoma balthica*, and *Yoldia* sp.). Green crabs and mummichugs were caught with baited traps. Other non-target fish species caught in traps included American eel (*Anguilla rostrata*), threespine stickleback (*Gasterosteus aculeatus*), and Atlantic silverside (*Menidia menidia*).

- Former Mine Pit: This portion of the Site is located under Goose Pond which is a "Water of the State" and owned by the State of Maine. With a current maximum depth of 91 m (300 feet) and a diameter of roughly 183 m (600 feet), this 4.2-ha (10.4-acre) area supports conditions notably different than elsewhere on the Site. Temperatures in the pit approached their lowest point at GP-08's benthic station depth, and hypoxic conditions were apparent at a depth of about 15.2 m (50 feet). Substrate sampling revealed a fine mud bottom of unknown depth overlying the pit's sculpted bedrock. Infaunal sampling in this area indicated the presence of a low-diversity community dominated by tubificid (*Enchytraeus* sp.) and polychaete worms (*Heteromastus filiformis*, *Polydora* sp., and Spionidae).
- Middle Goose Pond: This 10.0 ha (24.8 acre) area comprises the middle portion of Goose Pond, where the tidal channel nature of the impoundment is evident. The southern (upstream) terminus of the area is marked by the remnants of the old dam that was used to prevent north-flowing waters of Marsh Creek from entering the dewatered estuary during mining operations. The intertidal zone in this ecological area is characterized primarily by rocky shore and narrow fringe salt marsh to the east. Water depths observed during sampling as part of the OU1 RI was 1-2 feet. Fine mud and then salt marsh comprise most of the western intertidal area. The benthic flowering plant widgeon grass (*Ruppia maritima*) was observed, sometimes in high densities, closer to the old earthen dam. Fine mud substrates dominated the grab sample locations. Infaunal sampling conducted concurrently with sediment grabs indicated a macroinvertebrate community primarily comprised of polychaete worms (*Neanthes virens*, *Scoloplos* sp. and *Polydora* sp.), bivalves (*Mya arenaria* and *Macoma balthica*), and to a lesser extent, amphipods (*Corophium* sp. and *Gammarus* sp.). Chironomid larvae were notably abundant in the sample closest to the old dam (GP-12), indicating that conditions in Middle Goose Pond near the earthen dam are beginning to transition to more of a brackish regime. Signs of green crabs (i.e., tracks) were frequently observed, and mummichugs and three-spine sticklebacks were caught in baited traps. Mine waste was documented in the portion of Middle Goose Pond that extends from the earthen dam and extending along the length of WRP-3. This portion of Goose Pond is also considered Southern Goose Pond or South Goose Pond.
- Irregularly Flooded Area: This 4.8 ha (11.8 acre) area comprises the most obvious tidal channel section of Goose Pond. The Irregularly Flooded Area ecological area is bounded to the north (downstream) by the old earthen dam and to the south (upstream) at the point where north flowing Marsh Stream shifts to low salinity

brackish conditions. This segment of the flowage is subject to wide swings in flow and salinity. Observations suggest that, for at least a few days before and after the first and third quarter lunar phase (the neap tidal cycle), much of the substrate remains drained at low tide except for water pooled on the substrate surface and the shallow channel formed by Marsh Stream. On full moon and new moon tides (spring tides), this ecological habitat area is permanently flooded for over several days. Water depths in the area during sampling ranged from 2 cm to 22 cm (0.8 inches to 8.7 inches). The substrate in this ecological area is characterized primarily by deep fine mud and salt marsh. Widgeon grass was observed in sparse to (more commonly) moderate-high densities on fine mud substrate. Dense filamentous algae were sometimes present in a layer above the widgeon grass, supported by gas bubbles. The conditions in this habitat area apparently exert influence on the benthic community, most notably the wide fluctuations in water quality parameters and extended periods of drainage resulting in exposed substrate. Infaunal sampling indicated a macroinvertebrate community dominated by *Chironomus* sp. and in one case, a super-abundance (i.e., over 800 individuals) of mud snails (*Hydrobia* sp.). Amphipods (*Gammarus* sp.) were also collected from this area. Mummichugs and threespine sticklebacks were caught in baited traps in this ecological area. Several wadingbirds, greater yellowlegs (*Tringa melanoleuca*), were observed to be feeding for a period of several days on what appeared to be mummichugs. Mine waste was documented in the portion of the Irregularly Flooded Area that extends from the earthen dam and extending along the length of the Tailings Impoundment. This portion of Goose Pond is also considered Southern Goose Pond or South Goose Pond.

- Dyer Cove: This 3.1 ha (7.7 acre) ecological area is an almost completely enclosed basin known as Dyer Cove, which served as a settling pond during mine operations. Water depths in the area during sampling ranged from 1.0 to 6.2 feet. The intertidal zone in this ecological area is characterized by rocky, gravelly shore. Moderate-high density eelgrass (*Zostera marina*) beds were observed in northwest Dyer Cove. Leaves on these plants appeared to be stunted (less than 0.5 m (1.6 feet)), and most were brown or black. No evidence of wasting disease, such as spotting on young leaves, was observed. In the same area, moderate density widgeon grass growth was also observed. Substrates at grab sample sites were fine mud with a shell hash component, and infaunal sampling suggested a macroinvertebrate community dominated by several polychaete worm genera (*Neanthes virens*, *Nephyts* sp., *Heteromastus filiformis*, *Polydora* sp., and *Eteone* sp.) and soft shell clams (*Mya arenaria*). Mummichugs, Atlantic silversides, threespine sticklebacks, and American eels were caught in baited traps.

The salt marsh adjacent to Goose Pond is an area that comprises the 9.3 ha (23.0 acre) area of salt marsh that fringes the middle and southern portions of Goose Pond. The area extends from nearly the tip of Dyer Point to the southernmost extent of estuarine conditions on Marsh Creek. The northern portion of the marsh is relatively narrow, in some areas less than 10 m (32.8 feet) wide, and reaches its greatest breadth south (upstream) of the old freshwater dam. Sampling sites in this area were dominated by smooth cordgrass (*Spartina alterniflora*). Other

dominant vegetation within this area includes saltmeadow cordgrass (*Spartina patens*), narrow-leaved cat-tail (*Typha angustifolia*), and common reed (*Phragmites australis*).

Ecological receptors may be exposed to site-related contaminants through a variety of exposure pathways. A complete exposure pathway involves a potential for contact between a given receptor and contamination either through direct exposure to an abiotic medium or indirectly through prey consumption. Pathways are evaluated by considering information on contaminant fate and transport, ecosystems potentially affected, and the magnitude and extent of contamination. The potential routes of exposure are the means by which chemicals are transferred from a contaminated medium to ecological receptors. The routes by which ecological receptors may be exposed to COPCs at the Callahan Mine Superfund Site include:

- Benthic macroinvertebrates – ingestion and direct contact with sediment or surface water;
- Fish – ingestion and direct contact with sediment and surface water;
- Terrestrial plants – direct contact with soil or sediment;
- Soil community – ingestion and direct contact with soil or sediment; and
- Birds and mammals – ingestion of soil or sediment, surface water, and food.

Species representing various trophic levels were selected as representative receptor species to evaluate the assessment endpoints discussed in Section 2 of the BERA. The selected species are intended to be representative of other species at the same trophic level that share similar specific life history characteristics. These groups of species are generally referred to as guilds. By evaluating a representative member of a guild and by accounting for the predominant guilds, the uncertainty associated with missing an important species group or pathway is reduced.

The potential exposure pathways are illustrated in the Conceptual Site Model (CSM) which is shown on Figure 17. Tables 50 – 52 of this ROD summarize the assessment endpoints along with the measurement endpoints that were used to support the evaluation. Sections 2.3 thru 2.6 of the BERA discuss the CSM, assessment endpoints, risk questions, and measurement endpoints.

Table 50
Ecological Exposure Pathways of Concern

Receptor Group	Assessment Endpoint	Measurement Endpoints
Salt Marsh Plants	Maintenance of plant communities in the salt marsh exposure area that were potentially affected by past mining activities at the Site similar to those communities found at the reference site.	1A: Compare site salt marsh sediment metal concentrations to published sediment benchmarks protective of vascular plants (*Spartina* sp.) and to reference.
		1B: Compare concentrations in salt marsh plant tissue (*Spartina* sp.) to literature based effects thresholds and reference.
		1C: Perform field surveys to determine if the salt marsh (*Spartina* sp.) population is significantly different from reference.
Benthic Invertebrates	Maintenance of benthic invertebrate communities at the Site similar to those found at the reference site.	2A: Compare Site sediment AVS SEM concentrations to toxicity thresholds and reference.
		2B: Perform laboratory toxicity tests to measure survival and growth of two marine/estuarine benthic invertebrates (the amphipod *Leptocheirus plumulosus* and the polycheate *Neanthes arenaceodentata*) exposed to sediments collected from Site and reference areas. Compare toxicity test results to sediment and pore water chemistry data to try to identify a dose-response relationship in exposure areas demonstrating ecologically significant effects.
		2C: Compare tissue residue levels in benthic invertebrates collected from Site exposure areas to published tissue benchmarks and reference.
		2D: Compare the diversity and community structure of benthic invertebrates in sediments from Site exposure areas to reference.
Water Column Invertebrates	Maintenance of water column invertebrate (zooplankton) communities in Site surface waters similar to those found in the reference site.	3A: Compare total and dissolved metal concentrations in Site surface water to published surface water benchmarks and reference.
Fish	Maintenance of fish communities in aquatic Site exposure areas similar to those found in the reference locations.	4A: Compare total and dissolved metal concentrations in Site surface water to published surface water benchmarks and reference.
		4B: Compare tissue residue levels measured in whole fish collected from the Site exposure areas to published benchmarks and reference.
		4C: Calculate fish condition factors and compare to reference.

Table 51
Ecological Exposure Pathways of Concern

Receptor Group	Assessment Endpoint	Measurement Endpoints
Insectivorous Birds (estuarine)	Maintenance of insectivorous populations at the Site similar to those found in the reference site.	5A: Compare estimated daily dose for insectivorous bird species (spotted sandpiper) based on ingestion of prey in Site exposure areas to published avian Toxicity Reference Values (TRVs) and to reference.
Semi-Aquatic Piscivorous Birds	Maintenance of piscivorous populations at the Site similar to those found in the reference site.	6A: Compare estimated daily dose for piscivorous bird species (great blue heron) based on ingestion of prey in Site exposure areas to published avian Toxicity Reference Values (TRVs) and to reference.
Semi-Aquatic Predatory Birds	Maintenance of predatory bird populations at the Site similar to those found in the reference site.	7A: Compare estimated daily dose for predatory bird species (osprey) based on ingestion of prey in Site exposure areas to published avian Toxicity Reference Values (TRVs) and to reference.
Semi-Aquatic Mammals	Maintenance of semi-aquatic mammal populations at the Site similar to those found in the reference site.	8A: Compare estimated daily dose for semi-aquatic mammal (river otter) based on ingestion of prey in Site exposure areas to published mammalian Toxicity Reference Values (TRVs) and to reference.
Rare, Threatened, and Endangered species	Protection of individual bald eagles[2] foraging in aquatic habitats at the Site similar to those found in the reference site.	9A: Compare estimated daily dose for predatory bird species (bald eagle) based on ingestion of prey in Site exposure areas to published avian Toxicity Reference Values (TRVs) and to reference.

[2] Note that since the ecological risk assessment was finished the bald eagle has been removed from both the Federal and State Endangered and Threatened Species Lists.

Table 52
Ecological Exposure Pathways of Concern

Receptor Group	Assessment Endpoint	Measurement Endpoints
Terrestrial Plants	Maintenance of plant communities in terrestrial habitats at the Site similar to those found in a reference site.	10A: Compare site soil concentrations to benchmarks protective of terrestrial plants and reference.
		10B: Perform field surveys to determine if terrestrial plant communities on-Site are significantly different from terrestrial plant communities at reference locations
Soil Invertebrates	Maintenance of a soil invertebrate community in the terrestrial habitats at the Site similar to those found nearby in a reference site.	11A: Compare site soil concentrations to benchmarks protective of soil invertebrates and in reference.
		11B: Compare tissue residue levels in terrestrial invertebrates from the Halo area to published tissue benchmarks and to reference.
		11C: Compare diversity and community state of forest litter invertebrates data from Halo Area to the reference.
Terrestrial Insectivorous Birds	Maintenance of omnivorous populations of songbirds at the Site similar to those found at a reference site.	12A: Compare estimated daily dose for omnivorous song bird species (robin) based on ingestion of prey in Site exposure areas to published avian Toxicity Reference Values (TRVs) and to reference.
Terrestrial Predatory Birds	Maintenance of predatory bird populations at the Site similar to those found at a reference site	13A: Compare estimated daily dose for predatory bird species (red-tailed hawk) based on ingestion of prey in Site exposure areas to published avian Toxicity Reference Values (TRVs) and to reference.
Terrestrial Small Omnivorous Mammals	Maintenance of terrestrial mammal populations at the Site similar to those found in a reference area.	14A: Compare estimated daily dose for small omnivorous mammal species (white-footed mouse) based on ingestion of prey in Site exposure areas to published mammalian Toxicity Reference Values (TRVs) and to reference.
Terrestrial Small Worm-Eating Mammals	Maintenance of terrestrial mammal populations at the Site similar to those found in a reference area.	15A: Compare estimated daily dose for small worm-eating mammal species (short-tailed shrew) based on ingestion of prey in Site exposure areas to published mammalian Toxicity Reference Values (TRVs) and to reference.

c. Ecological Effects Assessment

Assessment and measurement endpoints were evaluated for the six aquatic exposure areas and two terrestrial areas. The specific methods used to assess each measure endpoint are explained in Section 3.0 of the BERA.

Assessment populations evaluated in aquatic exposure area food chain models included:

- Spotted sandpiper, representing insectivorous birds;
- Great blue heron, representing piscivorous birds;
- Osprey, representing predatory birds (bald eagle was used as surrogate for osprey, with emphasis on population-level effects rather than effects on individuals);
- River otter, representing semi-aquatic mammals; and

- Bald eagle, representing rare, threatened, and endangered species. Due to special status, bald eagles were evaluated for individual effects rather than population effects.[3]

Assessment populations evaluated in terrestrial exposure area food chain models included:

- Robin, representing omnivorous song birds;
- Red-tailed hawk, representing predatory birds;
- White-footed mouse, representing omnivorous small terrestrial mammals; and
- Short-tailed shrew, representing worm-eating small terrestrial mammals.

Reference locations were identified and paired with exposure areas based on important habitat characteristics including salinity, community characteristics, and tidal patterns for aquatic reference areas, and surrounding land use and natural community composition for terrestrial areas.

Both reasonable maximum exposures (RME) and central tendency exposures (CTE) were considered when assessing and characterizing risk. Pathways that were evaluated included direct contact with surface soil for terrestrial plants and invertebrates, direct contact with surface water and sediment for aquatic life (invertebrates and fish), and ingestion of surface water, incidental ingestion of soil or sediment, and ingestion of prey items for wildlife receptors. To supplement the analytical data that was used to develop the hazard quotients, a series of field studies were also performed to provide additional lines of evidence for the ecological risk evaluation in the BERA. A summary of these studies is provided below:

- A survey of the plants in the salt marsh was performed in 2005 and 2007. No live *Spartina* were observed near two seeps that discharge from WRP-3, and only a small amount was observed near a third seep that discharges from WRP-3. These areas were designated as location of "readily apparent harm" or RAH. Remnant *Spartina* stems occurring in a mat of salt marsh peat indicated that within the recent past (possibly one or two growing seasons), an episodic event led to complete *Spartina* mortality in areas of RAH. As these plots were all located near seeps from Waste Rock Pile 3, it is possible that some surface/ground water discharge may have been the episodic event.
- Over 100 sediment samples were evaluated for AVS and SEM to assess the bioavailability of the divalent metals Cd, Cu, Pb, Ni, Ag, and Zn to local sediment biota. The analytical data were first normalized to the fraction of organic carbon (f_{OC}) in each sediment sample, as follows: $(\Sigma SEM\text{-}AVS)/f_{OC}$. A review of these data indicates that all but six sediment samples have $(\Sigma SEM\text{-}AVS)/f_{OC}$ values below 130 $\mu mol/g_{OC}$, which is the threshold below where sediment toxicity is unlikely because the divalent metals are chemically unable to leach into porewater and overlying surface water and are therefore not bioavailable. Not one sample exceeded 3,000 $\mu mol/g_{OC}$, which is the threshold of likely toxicity. In contrast to this more

[3] See footnote 2.

theoretical evaluation of bioavailability, some of the field data do show contaminants of concern in sediment porewater and biota, proving that the contaminants were bioavailable, at least under some conditions.

- Sediment samples were collected in May 2007 from the top six inches of substrate at nine study area locations: three locations in Goose Cove marine habitat, six locations in Goose Pond Permanently Flooded habitat, and three locations in Goose Pond Irregularly flooded habitat, and subjected to chronic 10-day amphipod (*Leptocheirus plumulosus)* tests for survival and growth, and chronic 28- day marine worm (*Neanthes arenaceodentata)* tests for survival and growth. Two of the three locations within the area containing mine waste in Southern Goose Pond, which includes portions of the Middle Goose Pond and the Irregularly Flooded Area exposure areas, were identified as containing mine waste were found to exhibit acute toxicity (mortality), and the third location was ambiguous as to toxicity or lack of toxicity. No clear evidence of toxicity was found in the sediment toxicity tests that were performed in Goose Cove, Dyer Cove, Marsh Creek, North Goose Pond, or Stink Cove. Figure 18 shows the location of the sediment toxicity tests.
- Benthic community surveys were performed at the Site and compared with reference locations. No clear indication of benthic community impairment was detected in the benthic community survey. The survey was limited due to the very low diversity of species observed within the reference locations. The benthic community survey was assigned a lower weight in the overall risk evaluation because it may not have been sufficiently robust to distinguish low diversity driven by site chemicals versus low diversity driven by habitat conditions.

d. Ecological Risk Characterization

Risk Characterization is the final phase of the BERA. In the Risk Characterization, the information from the effects and exposure analyses was used to determine a probability of adverse effects to the receptors of concern and discuss the strengths, weaknesses, and assumptions in the BERA. Risk estimates (or Hazard Quotients) were developed for each assessment endpoint based upon comparison of site-specific media concentrations and/or estimated ingested contaminant dose estimates (the latter for wildlife) to effects levels (generic criteria, benchmarks and TRVs) for the various receptors of concern. Finally, risk was characterized for each assessment endpoint by integrating the risk estimate with the results of other lines of evidence. Section 4 of the BERA contains the Risk Characterization. A summary of the Risk Characterization is presented below.

Salt Marsh Plants: There is a high risk to salt marsh plants in areas of readily apparent harm, where vegetation is absent or stunted, located at the upland fringe of the salt marsh exposure area. Multivariate statistical analyses could not identify a significant contaminant specific dose-response relationship with sediment data from the same area. The cause of the areas of readily apparent harm is not known; it could be because of an episodic event from a seep discharge, chronic exposure to site seeps or sediments, or other naturally occurring environmental stressors. The *Spartina* sampled in the salt marsh is subject to periods of prolonged inundation and prolonged emergence and is generally growing in a higher intertidal elevation. A reduction of

tidal flow may also causes changes in soil chemistry. Sea water naturally contains large quantities of sulfur, which is reduced by soil bacteria into sulfide in the normally anoxic marsh soil conditions.

Benthic Invertebrates: The sediment toxicity tests in the Southern Goose Pond, which includes portions of the Middle Goose Pond and the Irregularly Flooded Area exposure areas, containing mine waste strongly indicated a potential risk to benthic invertebrate based on a finding of acute toxicity in two of the three sediment toxicity tests in this area. Risk to the benthic invertebrate community varies across the other locations. Sediment toxicity tests demonstrated ecologically significant effects to benthic invertebrates in Goose Cove at location GC-05 with respect to the *N. arenaceodentata* growth endpoint. However, no adverse ecologically significant effects were observed for the two other Goose Cove toxicity test locations, where sediment concentrations were higher.

The weight of evidence from AVS/SEM data and quantitative benthic community surveys compared to reference suggested that few areas of the sediment should present a high risk. Pore water data for that area also suggest the potential for adverse impacts despite the high AVS.

The toxicity test for the Goose Pond Irregularly Flooded sediment was ambiguous as one sample indicated potential toxicity and the other did not. Other samples from the Goose Pond Irregularly Flooded sediment outside the mine waste hot spot did not show toxicity. It should be noted that dramatic fluctuations in temperature, dissolved oxygen concentrations, and salinity concentrations observed in the Goose Pond Irregularly Flooded sediment area do not provide a stable environment for most freshwater or marine species.

Water Column Invertebrates: Surface water concentrations of copper and zinc were detected in Goose Pond at concentrations above National Recommended Water Quality Criteria which indicates a potential for adverse impacts to fish and aquatic organisms.

Fish: Surface water concentrations of copper and zinc were detected in Goose Pond at concentrations above National Recommended Water Quality Criteria which indicates a potential for adverse impacts to fish and aquatic organisms. Other lines of evidence, fish condition factors and fish tissue concentrations, did not suggest adverse population-level effects to fish in all aquatic exposure areas. Site contaminants, including copper, lead, and zinc were detected in fish tissue at concentration much greater than reference and background locations, indicating that trophic transfer of the contamination was occurring at the Site. It should be noted that dramatic fluctuations in temperature, dissolved oxygen concentrations, and salinity concentrations observed in South Goose Pond and in the Irregularly Flooded area do not provide a stable environment for most freshwater or marine species; however, there are estuarine species that are adapted to the environment.

Aquatic Insectivorous Birds: Adverse population-level effects to insectivorous birds (spotted sandpiper) are possible in the area containing mine waste in Southern Goose Pond and the salt marsh. The risk is due primarily to copper with a LOAEL based HQ of 5 in Goose Pond and 3.5

in the salt marsh. Adverse population-level effects were generally unlikely for other ecological exposure areas. Table 53 lists HQs for the bird and mammal aquatic receptors.

Aquatic Piscivorous Birds: Adverse population-level effects to piscivorous birds (great blue heron) are possible in the area containing mine waste in Southern Goose Pond and the salt marsh. The risk is due primarily to copper with a LOAEL based HQ of 12 in Goose Pond and 9.4 in the salt marsh, zinc with a LOAEL based HQ of 1.2 in Goose Pond and the salt marsh, and lead with a LOAEL based HQ of 1 in Goose Pond and 1.3 in the salt marsh. Adverse population-level effects were generally unlikely for other ecological exposure areas. Table 53 lists HQs for the bird and mammal aquatic receptors.

Aquatic Predatory Birds, Semi-Aquatic Mammals, and Rare, Threatened, & Endangered Species: The risk assessment concluded that in all six aquatic exposure areas, risk of harm to Predatory Bird (osprey), Semi-Aquatic Mammal (river otter), and Threatened, & Endangered Species (bald eagle) is unlikely regardless of exposure scenario. The bald eagle has been delisted from the Federal Endangered and Threatened Species List and has been removed from the Maine Threatened Species List. Table 53 lists HQs for the bird and mammal aquatic receptors.

Terrestrial Plants and Soil Invertebrates, Terrestrial Insectivorous Birds, Terrestrial Predatory Birds Terrestrial Small Omnivorous Mammals, and Terrestrial Small Worm-Eating Mammals: Based on the weight of evidence and confidence and uncertainties in the data, adverse population-level impacts to terrestrial plants, terrestrial invertebrates, birds (robin, hawk), and mammals (white-footed mouse and short-tailed shrew) in the source area may be possible from metals, including cadmium, copper, lead, and zinc, and PCBs. The high incremental risk HQs support the high confidence in this conclusion. Much of the former mine operations area contains no vegetation or very sparse vegetation because soils were grubbed and then left bare during mining operations, or because the soils consist of material left from mining operations. The materials that remain provide little or no growth medium for plants because of their texture, and provide poor habitat for terrestrial invertebrates which serve as food sources for robin. Receptors are, therefore, not likely to forage frequently at the source area. Based on the weight of evidence and confidence and uncertainties in the data, risk of harm to terrestrial plant, terrestrial invertebrate, bird, and mammal communities in the Halo Area from most COPCs is unlikely.

Table 53
Food Chain Modeling Hazard Quotients

Goose Pond				
Eagle				
No COCs with HQs above 1 for NOAEL or LOAEL				
Great Blue Heron	**NOAEL HQ**		**LOAEL HQ**	
Analyte	**CT**	**RME**	**CT**	**RME**
Copper	**2.0**	**6.8**	**1.5**	**5.2**
Lead	**1.5**	**3.5**	**0.29**	**0.7**
Zinc	**3.7**	**8.7**	**0.4**	**0.96**
River Otter				
No COCs with HQs above 1 for NOAEL or LOAEL				
Spotted Sandpiper	**NOAEL HQ**		**LOAEL HQ**	
Analyte	**CT**	**RME**	**CT**	**RME**
Copper	**5.3**	**19**	**4.1**	**14**
Lead	**2.7**	**5.2**	**0.54**	**1.0**
Zinc	**6.1**	**1`**	**0.67**	**1.2**
Salt Marsh				
Eagle				
No COCs with HQs above 1 for NOAEL or LOAEL				
Great Blue Heron	**NOAEL HQ**		**LOAEL HQ**	
Analyte	**CT**	**RME**	**CT**	**RME**
Copper	**2.7**	**4.6**	**2.1**	**3.5**
Lead	**1.3**	**3.5**	**0.27**	**0.68**
Zinc	**4.2**	**6.8**	**0.47**	**0.75**
River Otter				
No COCs with HQs above 1 for NOAEL or LOAEL				
Spotted Sandpiper	**NOAEL HQ**		**LOAEL HQ**	
Analyte	**CT**	**RME**	**CT**	**RME**
Copper	**7.3**	**12**	**5.6**	**9.4**
Lead	**2.5**	**6.8**	**0.49**	**1.3**
Zinc	**6.7**	**11**	**0.74**	**1.2**
Goose Cove				
Eagle				
No COCs with HQs above 1 for NOAEL or LOAEL				
Great Blue Heron	**NOAEL HQ**		**LOAEL HQ**	
Analyte	**CT**	**RME**	**CT**	**RME**
Copper	**0.49**	**1**	**0.38**	**0.76**
Lead	**0.55**	**1**	**0.11**	**0.2**
Zinc	**0.96**	**1.8**	**0.11**	**0.2**
River Otter				
No COCs with HQs above 1 for NOAEL or LOAEL				
Spotted Sandpiper	**NOAEL HQ**		**LOAEL HQ**	
Analyte	**CT**	**RME**	**CT**	**RME**
Copper	**0.7**	**1.3**	**0.55**	**0.99**
Lead	**0.66**	**1.2**	**0.13**	**0.24**
Zinc	**1.1**	**2.1**	**0.13**	**0.23**

The Southern Goose Pond mine waste hot spot (which includes portion of Middle Goose Pond and the Irregularly Flooded Area) was identified as an area that represents an unacceptable threat to ecological receptors for the following reasons:

- This area contains concentrations of copper, lead, and zinc well above level considered protective of ecological receptors, particularly, birds, fish, and benthic organisms. Both the average and 95% Upper Confidence Limit of the mean concentration exceed the Site specific protective levels for copper, lead, and zinc. Of the samples collected for analysis in the Southern Goose Pond mine waste hot spot, 72 percent of the samples were above the Site specific protective level for copper, 37 percent of the samples were above the Site specific protective level for lead, and 64 percent of the samples tested were above the Site specific protective level for zinc;
- Sediment toxicity testing identified areas of acute toxicity, with two of the three toxicity tests in this area demonstrated acute toxicity (These locations are shown in Figure 18);
- The habitat analysis confirmed that the insect eating and fish eating receptors could use this area. Food chain modeling identified the hazard quotients above Site specific effect based protective levels which indicates a significant potential for adverse impacts to these receptors in this area;
- Transfer of contaminants from the sediment to the biota was confirmed by biota tissue sampling. Clam tissue concentrations for lead are more than 10 times background with copper, and zinc concentrations in tissue are greater than background and other areas of the Site. In addition, fish tissue concentrations for the mine waste hot spot and the area immediately south of the hot spot, which likely includes fish that forage in the hot spot, are well above background for lead, copper, and zinc;
- While benthic community data did not reveal any significant change when compared to reference locations, the study design may not have been sufficiently robust to discern impairment due to site chemicals of concern; therefore more weight was given to the toxicity data. Also, the information collected as part of the clam survey suggests that there are fewer clams, and the resident clams are smaller than in other areas of the Site with lower levels of sediment contaminants; and
- Pore water data for this area showed concentrations in pore above NRWQC.

The salt marsh mine waste hot spot was identified as an area that represents an unacceptable threat to ecological receptors for the following reasons:

- This area contains also concentrations of copper, lead, and zinc well above levels considered protective of ecological receptors, particularly, birds, fish, and benthic organisms. Both the average and 95% Upper Confidence Limit of the mean concentration exceed the Site specific protective levels for copper, lead, and zinc. Of the samples collected for analysis in the Southern Goose Pond mine waste hot spot, 82 percent of the samples were above the Site specific protective level for copper, 42 percent of the samples were above the Site specific protective level for lead, and 59 percent of the samples tested were above the Site specific protective level for zinc;

- The habitat analysis confirmed that the insect eating and fish eating receptors could use this area. Food chain modeling identified the hazard quotients above Site specific effect based protective levels which indicates a significant potential for adverse impacts to these receptors in this area;
- Plant tissue uptake of contaminants was confirmed by plant tissue sampling. Concentrations of copper, lead, and zinc were greater than background; and
- Areas of dead vegetation (readily apparent harm) were identified at the locations of several seeps along the base of WRP-3.

Although the average and UCL for copper and zinc exceeded the Site specific protective levels in Dyer Cove, the toxicity testing and food chain modeling did not suggest the potential for significant ecological impacts that would require remediation. Clam and fish tissue concentrations were above background, but were lower than the other mine waste hot spots. Goose Cove was also not identified as an area that represents an unacceptable threat the area of Goose Cove containing the mine waste is too deep to be considered accessible habitat for the insect eating or fish eating birds. Toxicity testing did not reveal acute toxicity in this area. These do, however, contain areas of mine waste that cover the natural bottom. The Goose Cove bottom habitat has been substantially altered by the mine waste, changing the habitat from a rock bottom to a mud bottom. Also, it has been reported that the mine waste is suspended by prop wash during lower tides and possibly from commercial scallop dredging.

In summary, the area of Southern Goose Pond and adjacent salt marsh containing mine waste and exceeding the ecological Site specific protective levels was identified as having the potential for adverse ecological effects and, therefore, meeting thresholds for remediation. The other aquatic exposure areas at the Site along with the terrestrial areas will be the focus of the OU2 RI/FS and ROD.

Table 54
COC Concentrations Expected to Provide Adequate Protection Of Ecological Receptors

Habitat Type/Name	Exposure medium	Chemical of Concern	Site Specific Protective Level mg/kg	Basis	Assessment Endpoint
Marine and freshwater sediment, including salt marsh	Sediment	Copper	790	Ecological Effect – Set at a level that would not exceed a LOAEL of 1. The lower of LOAELs for great blue heron or spotted sandpiper	Maintenance of insectivorous and piscivorous populations at the Site similar to those found in the reference site.
		Lead	710	Ecological Effect – Set at a level that would not exceed a LOAEL of 1.Ecological Effect - Lower of LOAELs for great blue heron or spotted sandpiper	Maintenance of insectivorous and piscivorous populations at the Site similar to those found in the reference site.
		Zinc	5100	Ecological Effect – Set at a level that would protect the Benthic Macroinvertebrate Community from acute effects (mortality) based on the Dose-Response Value – High	Maintenance of benthic invertebrate communities at the Site similar to those found at the reference site.

3. Overall Risk Assessment Conclusion—Basis for Response Action

The baseline Human Health Risk Assessment for OU1 revealed that an unacceptable human health risk would exist as a result of ingestion and direct contact with PCB contaminated soil in the former Mine Operations Area. The lifetime excess cancer risk for a recreational visitor (current exposure pathway) exposed to PCBs at the Site was estimated at 1.2×10^{-3} and the non-cancer hazard quotient was 166 for a child. Three residential properties in current use also have concentrations of lead in excess of the EPA policy threshold for a response, which is to protect 95% of the sensitive population against blood lead levels in excess of 10 ug/dl blood. Locations in the Residential Use Area of the Site identified as Lots A, C, and D in the HHRA all have lead concentrations that are predicted to result in a blood lead level in excess of the EPA policy threshold. For Lot A, 29% of the sensitive population would have a blood lead level above 10 ug/dl. For Lot C, 30% of the sensitive population would have a blood lead level above 10 ug/dl. For Lot D, 31% of the sensitive population would have a blood lead level above 10 ug/dl. Lot D was also found to have level of thallium that result in a non-cancer hazard quotient of 1.4.

The BERA revealed that unacceptable risk would exist for benthic organisms, fish communities, and birds from sediment in Southern Goose Pond and the adjacent salt marsh and water discharging from the seeps. For benthic organisms and fish, levels of the contaminants of concern exceed National Recommended Water Quality Criteria for copper and zinc which indicates a potential for adverse impacts to fish and aquatic organisms. Acute toxicity to benthic organisms was also document by sediment toxicity tests. Two of the three sediment toxicity tests

performed using sediment from the Southern Goose Pond mine waste area were found to be acutely toxic and the third was inconclusive. Food chain modeling for fish-eating and insect-eating birds revealed hazard quotients above Site specific effect based concentrations, which suggests a significant potential for adverse impacts to these receptors. Samples collected from pore water also reveal levels of contaminants above National Recommended Water Quality Criteria for copper and zinc. Biota tissue samples obtained from fish and clams document that the contaminants of concern, particularly lead, are accumulating in the Site biota at concentrations much higher than background. Concentrations of lead in the biota found within and adjacent to Southern Good Pond mine waste area are substantially above background and higher than other areas of the Site. Figure 18 identifies the areas found to have acute toxicity and biota tissue above background.

As such, actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment. Figure 4 identifies the areas that present a threat to Human Health and the Environment that are targeted for consideration in OU1.

H. REMEDIATION OBJECTIVES

Based on preliminary information relating to the types of contaminants, environmental media of concern and potential exposure pathways, response action objectives (RAOs) were developed to aid in the development and screening of alternatives. These RAOs were developed to mitigate, restore and/or prevent existing and future potential threats to human health and the environment.

EPA develops Remedial Action Objectives (RAOs) for each cleanup action. The specific RAOs for OU1 are presented in Section 2.2 of the OU1 FS and are summarized below:

- Protect current and future recreational visitors by preventing direct contact and incidental ingestion of site soils and waste material containing PCBs that represent a non-cancer threat with a HQ greater than 1 and a cancer risk greater than $1x10^{-6}$ using the site-specific risk assessment assumptions for current and future recreational use.
- Protect current residents by preventing direct contact and incidental ingestion of site soils and waste material in the current Residential Use Area of the Site containing lead that would result in greater than 5 percent of the exposed population with a blood lead level above 10 ug/dl, or the Maine Solid Waste Lead Remediation Regulations, whichever is lower, using the site-specific risk assessment assumptions for current and future residential use.
- Protect current residents by preventing direct contact and incidental ingestion of site soils and waste material in the current Residential Use Area of the Site containing arsenic above background levels that represent a non-cancer threat with a HQ greater than 1 and a cancer risk greater than $1.4x10^{-5}$ using the site-specific risk assessment assumptions for current and future residential use.

- Prevent exposure of biota to sediment, including the sediment/soil in the salt marsh, with concentrations of copper, lead, or zinc that may represent a threat to insectivorous and piscivorous birds, fish, and other aquatic organisms.
- Minimize acid rock drainage from mineralized waste rock and tailings that may act as a continuing source of copper, lead, and zinc to groundwater, surface water, and sediment.
- Stabilize the Tailings Impoundment berm to achieve acceptable stability criteria.
- Comply with all Federal and State ARARs, including achieving closure standards under State mining regulations.

I. DEVELOPMENT AND SCREENING OF ALTERNATIVES

1. Statutory Requirements/Response Objectives

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including: a requirement that EPA's remedial action, when complete, must comply with all Federal environmental and more stringent State environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked; a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances is a principal element over remedies not involving such treatment. Response alternatives were developed to be consistent with these statutory mandates.

2. Technology and Alternative Development and Screening

CERCLA and the NCP set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives were developed for the Site.

With respect to the response action, the OU1 RI/FS developed a limited number of remedial alternatives that attain Site cleanup levels within different time frames using different technologies, as well as a no-action alternative.

As discussed in Section 2 of the OU1 Feasibility Study Report, technology options were identified, assessed and screened based on implementability, effectiveness and cost. The sediment screening process identified only one sediment technology as appropriate for sediment remediation. In particular, the screening confirmed that *in-situ* capping and monitored natural recovery were not suitable based on site conditions. The majority of the salt marsh and the southern Goose Pond sediment does not have a sufficient depth of water to allow a one foot cover to accumulate. A cover of that thickness could change much of the salt marsh to upland. Section 3 of the OU1 Feasibility Study Report presented the remedial alternatives, developed by combining the technologies identified in the previous screening process, that fit the alternative

categories identified in Section 300.430(e)(3) of the NCP. The purpose of the initial screening was to narrow the number of potential remedial actions for further detailed analysis while preserving a range of options. Each alternative was then evaluated in detail in Section 4 of the OU1 Feasibility Study Report.

J. DESCRIPTION OF ALTERNATIVES

This Section provides a narrative summary of each alternative evaluated. Each of the alternatives is summarized below. A more complete, detailed presentation of each alternative can be found in Sections 3 and 4 of the OU1 Feasibility Study Report.

A brief summary of the alternatives retained for detailed analysis within each area is presented in the following section. The costs for each alternative include the estimated capital costs, the estimated annual operation and maintenance (O & M) cost, and the present value of the combined capital and maintenance costs based on a 30 year time period and 7% discount rate.

EPA considers a full range of alternatives to clean up a Superfund site before selecting a remedy. Many options are screened out early in the process because site-specific conditions render them ineffective and/or technically or administratively infeasible. Others are eliminated because they are cost prohibitive to implement. For the Callahan Mine Superfund Site, alternatives that require the off-site transport of the waste rock, sediment, or tailings were eliminated due to cost and community concerns. In addition, the only approach that was retained for the sediment cleanup was excavation or dredging because the site conditions would not allow for in-place capping or monitored natural recovery. The cleanup alternatives that survived the initial screening were subject to a detailed evaluation and comparative analysis in the OU1 FS. These cleanup alternatives are summarized below.

Alternative CMS1 – No Action

Alternative CMS1, the No Action alternative, was retained as a baseline with which to compare the other alternatives, as required by CERCLA. This alternative does not include remedial action components to reduce the contribution of site source areas to groundwater, surface water, or sediment contamination. No action would be taken to reduce, control, or eliminate direct exposure risks from exposure to PCBs within the former Callahan Mine property. No action would be taken to reduce, control, or eliminate direct exposure risks from exposure to arsenic, lead, and thallium to residents of seasonal properties along Old Mine Lane. No action would be taken to reduce, eliminate, or control risks to ecological receptors in Goose Pond or salt marsh areas. No institutional controls would be implemented to prohibit potable use of site groundwater or residential development of the Site. The only activity required by CERCLA under this alternative is to assess site conditions at least every five years. The estimated present value cost of CMS1 is $19,000.

<u>Alternative CMS2</u> – Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum[4] Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, and WRP-3), Residential Use Area Soil, and Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

Alternative CMS2 includes: construction of surface water diversions to reduce the amount of upslope runoff flowing onto and infiltrating the Tailings Impoundment; installation of a low-permeability cover system to contain and isolate the Tailings Impoundment; installation of a horizontal drain, or other drainage methods (e.g. vertical wells or drains), to facilitate the dewatering of the Tailings Impoundment and the collection and treatment of the discharge from the horizontal drain, or other drainage methods (e.g. vertical wells or drains), in a constructed wetland; subaqueous disposal of WRP-3, Ore Pad, and Mine Operations Area source material and Residential Use Area soil exceeding Site specific sediment cleanup levels in a CAD cell in the former mine pit; and off-site disposal of material contaminated with PCBs and waste commingled with petroleum. It is possible that additional measures, including a toe shear key or buttress would be identified during design as a necessary component to stabilize the Tailings Impoundment. Alternative CMS2 also includes the dredging and subaqueous disposal of sediments exceeding Site specific sediment cleanup levels in southern Goose Pond and the adjacent salt marsh in a CAD cell in the former mine pit. Dyer Cove and Goose Cove sediments that contain mine waste would also be dredged and disposed in the CAD cell in the former mine pit as part of Site restoration and wetland mitigation activities. Additional components include institutional controls to prevent disturbance to the components of the remedy, long-term operation and maintenance of the permanent components of the remedy (Tailing Impoundment cover, treatment wetland, monitoring wells, and CAD cell), environmental monitoring, and five-year reviews to control potential human-health and ecological risks due to exposure to contaminated waste material.

The estimated present value cost of CMS2 is $22.8 million. Figure 19 shows the major features of CMS2.

<u>Alternative CMS3</u> - Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Capping of Source Area Material (from the Ore Pad, Mine Operations Area, WRP-3) and Residential Use Area Soil; and Subaqueous Disposal of Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

Alternative CMS3 includes: construction of surface water diversions to reduce the amount of upslope runoff flowing onto and infiltrating the Tailings Impoundment; installation of a low-permeability cover system to contain and isolate the Tailings Impoundment; installation of a horizontal drain, or other drainage methods (e.g. vertical wells or drains), to facilitate the dewatering of the Tailings Impoundment and the collection and treatment of the discharge from the horizontal drain, or other drainage methods (e.g. vertical wells or drains), in a constructed wetland; disposal of WRP-3, Ore Pad, and Mine Operations Area source material and

[4] At the Callahan Mine Superfund Site, petroleum waste is intermixed with contaminated mine waste. Although CERCLA does not regulate petroleum cleanups, the commingled contaminated material containing CERCLA waste and petroleum waste will be cleaned up as part of the proposed CERCLA remedy.

Residential Use Area soil exceeding Site specific sediment cleanup levels into an on-Site waste cell that would then have a low permeability cover system installed over the waste; and off-site disposal of material contaminated with PCBs and waste commingled with petroleum. It is possible that additional measures, including a toe shear key or buttress would be identified during design as a necessary component to stabilize the Tailings Impoundment. Alternative CMS3 also includes the dredging and subaqueous disposal of sediments exceeding Site specific sediment cleanup levels in southern Goose Pond and the adjacent salt marsh in a CAD cell in the former mine pit. Dyer Cove and Goose Cove sediments that contain mine waste would also be dredged and disposed in the CAD cell in the former mine pit as part of Site restoration and wetland mitigation activities. Additional components include institutional controls, long-term operation and maintenance of the permanent components of the remedy (waste covers, treatment wetland, monitoring wells, and CAD cell), environmental monitoring, and five-year reviews.

The estimated cost of CMS3 is $25.5 million. Figure 20 shows the major features of CMS3.

K. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that at a minimum EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

A detailed analysis was performed on the alternatives using the nine evaluation criteria in order to select a site remedy. The following is a summary of the comparison of each alternative's strengths and weaknesses with respect to the nine evaluation criteria. These criteria are summarized as follows:

Threshold Criteria

The two threshold criteria described below must be met in order for the alternatives to be eligible for selection in accordance with the NCP:

1. Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2. Compliance with applicable or relevant and appropriate requirements (ARARs) addresses whether or not a remedy will meet all Federal environmental and more stringent State environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked.

Primary Balancing Criteria

The following five criteria are utilized to compare and evaluate the elements of one alternative to another that meet the threshold criteria:

3. Long-term effectiveness and permanence addresses the criteria that are utilized to assess alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

4. Reduction of toxicity, mobility, or volume through treatment addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the Site.

5. Short-term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

6. Implementability addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. Cost includes estimated capital and Operation and Maintenance costs, as well as present-worth costs.

Modifying Criteria

The modifying criteria are used as the final evaluation of remedial alternatives, generally after EPA has received public comment on the RI/FS and Proposed Plan:

8. State acceptance addresses the State's position and key concerns related to the preferred alternative and other alternatives, and the State's comments on ARARs or the proposed use of waivers.

9. Community acceptance addresses the public's general response to the alternatives described in the Proposed Plan and RI/FS.

Following the detailed analysis of each individual alternative, a comparative analysis, focusing on the relative performance of each alternative against the nine criteria, was conducted. This comparative analysis can be found in Section 5 of the OU1 Feasibility Study Report.

The section below presents the nine criteria and a brief narrative summary of the alternatives and the strengths and weaknesses according to the detailed and comparative analysis.

Only those alternatives that satisfied the first two threshold criteria were balanced and modified using the remaining seven criteria.

Comparative Analysis of Alternatives

Each alternative is evaluated using the two threshold and five balancing criteria in detail as part of the FS. After completion of the detailed evaluation of alternatives, a comparative analysis of the alternatives was performed to identify the alternative that satisfies the two threshold criteria of protection of human health and the environment and compliance with ARARs. Then the alternatives are assessed to determine which is the best option based on the five balancing criteria. The comparative analysis from the OU1 FS is summarized below.

Threshold Criteria

1. Overall Protection of Human Health and the Environment.

Alternative CMS1, the No Action Alternative, would not eliminate, reduce, or control source areas or potential future exposure to contaminants exceeding Site specific sediment cleanup levels and would not meet the RAOs. Therefore, it is not protective of human health and the environment and cannot be chosen as a final remedy.

Alternatives CMS2 and CMS3 would each be protective of human health and the environment. Both alternatives would eliminate the direct contact and incidental ingestion risks from PCBs (off-site disposal) and arsenic, and lead (on-site disposal). The PCBs will be taken to an appropriate off-site facility and the arsenic and lead in the residential area will either be disposed of in the CAD cell in the former mine pit (CMS2) or capped on-site (CMS3). The removal of the Ore Pad material will also control the most significant source of groundwater contamination. The removal of the Ore Pad, Mine Operations Area, and WRP-3 and either its disposal in the CAD cell (CMS2) or on-site capping (CMS3) will also remove and/or control significant sources of surface water contamination. Removal of WRP-3 and capping/stabilization of the Tailings Impoundment would prevent these areas from acting as a source of sediment and surface water contamination. Removal of the sediments that were found to be acutely toxic and which also represent a food chain threat and disposal into the CAD cell will eliminate that threat to the site biota. Both alternatives would implement long-term operation and maintenance of the remedial components and institutional controls to prevent site use that could damage the components of the cleanup (particularly capped areas and the CAD cell).

Alternatives CMS2 and CMS3 are very similar in the degree to which they achieve protection of human health and the environment. CMS2 is more protective due to the greater long-term effectiveness afforded by placement of the material in the CAD cell (which is a chemically and physically stable environment for sequestering the reactive mine waste) vs. reliance on an on-site cover system (which has greater chance for releasing contaminants in the event of cover failure).

Both alternatives are equal with regard to protecting wetlands resources, since both alternative remove Site contaminants that are impairing wetland resources. Use of the CAD cell for disposal of contaminated media can be implemented in a manner that will not impair the aquatic resources of Goose Pond. Both alternatives include mitigation for altered wetland resources by the removal of mine wastes from Dyer and Goose Coves and disposal of the mine waste into the CAD cell. As required by Federal Executive Order 11990, entitled "Protection of Wetlands," through the OU1 Proposed Plan, the public was invited to comment on the EPA's plans to protect wetland resources through the proposed remedial action. The public was generally supportive of EPA's determination that alternative CMS2 was the least damaging practicable alternative for protecting wetland resources. Specific comments are addressed in Appendix C.

2. Compliance with ARARs.

Alternative CMS1, No Action, would not comply with the ARARs identified in the OU1 Feasibility Study; therefore, it cannot be chosen as a final remedy.

Alternatives CMS2 and CMS3 would comply with the ARARs identified in the OU1 Feasibility Study. In particular, they would comply with the State of Maine mining rules and the Federal Clean Water Act (CWA). Both alternatives include significant mitigation of impacts to wetland resources from the remedial action, in compliance with Federal and State wetlands protection standards, through the dredging of mine wastes from Dyer and Goose Coves and disposal of the contaminated material into the CAD. The selected alternative (CMS2) was found to be the least damaging practicable alternative for addressing risks to wetland resources at the Site, in accordance with Section 404(b) of the CWA. This is due to a CMS2's greater reliance on on-site disposal of wastes in the environmentally-stable CAD, versus the creation of a land-based disposal cell, under CMS3, that will have more long-term maintenance issues that could negatively affect wetland resources in the future.

Both alternatives comply with the Toxic Substances Control Act (TSCA) and its regulations through the excavation and off-site disposal of all PCB contaminated media exceeding a 1 ppm cleanup level. This cleanup level was found to prevent any unreasonable risk of injury to health or the environment from exposure to PCBs.

Balancing Criteria

3. Long-term Effectiveness and Permanence.

Alternative CMS1, No Action, would not achieve this criterion since there would be no actions to protect human health or the environment.

Both alternatives CMS2 and CMS3 would provide long-term effectiveness and permanence. Both rely on the use of a cover system and stabilization of the Tailings Impoundment. Given the large quantity of material and the difficulty in relocating tailings, this is the more effective and permanent approach to achieve the RAOs and comply with ARARs for

the Tailings Impoundment. With maintenance, cover systems provide reliable long-term controls. Both CMS2 and CMS3 remove the PCBs and transport the material to an appropriate off-site disposal location. This will be a long-term effective and permanent solution to prevent future contact with PCBs at the Site. Both CMS2 and CMS3 excavate the sediments that represent a threat to site biota. Subaqueous containment of the material in a CAD cell in the former mine pit will provide a high degree of long-term effectiveness and permanence. The material will be placed well below the rim of the mine pit and at a depth such that no disturbance of this material should occur due to tidal action, even during storm events. No maintenance beyond institutional controls to prevent deep water activities or dredging of this location would be necessary. CMS2 relies on this same approach to control the source material at WRP-3, Ore Pad, Mine Operations Areas (excluding PCBs and petroleum contaminated material which will be disposed of off-site) and arsenic and lead waste removed from the Residential Use Area. CMS3 would place source material from WRP-3, Ore Pad, Mine Operations Areas (excluding PCBs and petroleum contaminated material which will be disposed of off-site) and arsenic and lead waste removed from the residential areas in an on-site cell and install a cover system as the long-term control. While this is an acceptable cleanup approach, the reliance on the long-term maintenance and periodic repairs to the cover system may result in a slightly lower degree of long-term effectiveness and permanence for CMS3.

CMS2, therefore, has a higher degree of long-term effectiveness and permanence than either CMS3 or CMS1.

4. Reduction of Toxicity, Mobility, or Volume through Treatment.

Alternative CMS1 does not contain any components to reduce the toxicity, mobility, or volume of contaminants through treatment.

Alternatives CMS2 and CMS3 rely on off-site disposal rather than treatment for the principal threat waste (PCBs) since the vast majority of PCB contaminated material is below EPA's guidance levels for treatment for PCBs and the quantity of PCBs materials is too small to warrant consideration of on-site treatment. Under both alternatives, the option is retained to have PCBs treated off-site prior to disposal, if warranted. The major components of CMS2 and CMS3 are source control measures for large volumes of low level threat wastes, which is consistent with EPA guidance. The wetlands treatment systems installed for both CMS2 and CMS3 would achieve some level of reduction in toxicity, mobility, and volume through treatment as a result of the sulfide reduction to immobilize the metals in the treatment matrix.

5. Short-term Effectiveness.

Alternative CMS1 takes no actions; so it does not achieve the RAOs. It would, however, have the lowest level of short-term impacts. Alternatives CMS2 and CMS3 have short-term effects with regard to the removal of the lead and arsenic contamination in the Residential Use Area. This work would be scheduled to avoid periods when the seasonal residents occupy these homes. The homes themselves would not be altered by the cleanup. For the common components of CMS2 and CMS3, there would also be similar short-term impacts due to truck

traffic transporting the PCB and petroleum contaminated material off-site for disposal and bringing the necessary materials to the Site for the remediation activities. There would also be truck traffic associated with the importation of the materials for the wetland treatment system and, over the long-term, removal of contaminated material from the treatment wetland systems.

The OU1 FS included a remediation approach that fully considered the community's concerns regarding truck traffic. The cover systems would be constructed using geosynthetic material, which would require a relatively low volume of traffic, along with the use of stone from an on-site quarry. The use of on-site material eliminates several thousand truck trips on local roads. The cover over the Tailings Impoundment would not include a vegetative cover because there is not enough suitable cover material on-site to establish vegetation across the entire area and the amount of truck traffic on local roads that would be required to bring in off-site material would be prohibitive. In addition, the fundamental approach to consolidate material on-site, under a cap or within a CAD cell, eliminates tens of thousands of truck trips that would be required on local road if the waste material were to be transported off-site.

Both CMS2 and CMS3 would result in short-term impacts to the wetland areas that are subject to excavation. Some permanent loss of these areas may occur to accommodate storm water control structures and the wetland treatment system associated with the cover system for the Tailings Impoundment. The areas that are not subject to permanent loss are expected to fully recover and achieve a higher level of function and value post-cleanup with the removal of the Site contaminants. In addition, there will be a permanent loss of the wetland areas that reside within the footprint of the Tailings Impoundment, WRP-3, and the Mine Operations Area. Some portion, and possibly all of the wetland on WRP-1 that contains the Stink Cove sediments would also be lost, depending upon the amount of material from this area that may be used for on-site restoration activities. There will be short-term impacts to sub-tidal areas subject to dredging or excavation. However, the permanent removal of mine material from these areas will create a long-term benefit to the environment. Natural restoration is expected to occur relatively quickly, in addition to any supplemental restoration activity that may be implemented, such as the establishment of eel-grass beds. Under both alternatives there will be short-term impacts from the removal of mine wastes from Dyer and Goose Coves to address wetland mitigation. However, the altered aquatic habitats will be restored to pre-mine conditions and should revert to natural conditions relatively quickly.

For CMS2 and CMS3, the time period to achieve the RAOs will be short. The RAOs will be achieved once the source control and sediment activities are completed.

Overall, CMS2 and CMS3 are equal in time needed to achieve protection. CMS2 has a slightly lower degree of short term impacts because CMS3 requires additional quantities of materials to construct the second cover system.

6. Implementability.

Alternative CMS1 takes no action, other than five-year reviews, and therefore would be technically easy to implement. Services and equipment are available to implement Alternatives

CMS2 and CMS3. Construction of the cover systems would require large volumes of soil/crushed stone which is not currently available on site. On-site quarrying of non-sulfide rock would be performed to obtain material. None of these alternatives would interfere with the ability to undertake additional remedial actions. Dredging of contaminated sediments and mine waste in the salt marsh and subtidal area and their disposal into the CAD cell can be implemented with established dredging technology. Under CMS2, disposal of upland mine waste into the CAD cell will involve additional material handling effort than capping the waste under CMS3, but technologies are available to move the material and dispose of it into the CAD cell.

The administrative feasibility of obtaining regulatory approvals and the necessary permits for any off-site actions is considered good to the extent required for Alternatives CMS2 and CMS3. The administrative process to obtain institutional controls to protect the components of the remedy (caps, treatment wetland, monitoring wells, and the CAD cell) also may be implemented for both CMS2 and CMS3. CMS2 and CMS3 are equal with respect to implementability.

7. Cost.

Of the two alternatives that would protect human health and the environment and comply with ARARs, CMS2 is the less expensive one that meets these threshold criteria.

Table 55
Costs for Alternatives

Cost Category	CMS1	CMS2	CMS3
Capital Costs (millions)	$0	$21.5	$24.1
Total Present Worth (30 yrs @ 7%) (millions)	$0.019	$22.8	$25.5

Modifying Criteria

8. State Acceptance.

The evaluation of this criterion is based on the input from the State throughout the evaluation process to develop a remedy for the Site. EPA has a clear understanding of the State perspective with respect to the cleanup options under consideration and has addressed the State's questions and comments raised during the public comment period within the Responsiveness Summary (Appendix C). Over the past six years, EPA has committed substantial resources to involve the State in the cleanup process. The alternatives presented in the OU1 Feasibility Study Report, Proposed Plan, and this ROD reflect the dialogue among EPA, Maine DEP, and other State agencies and officials.

Maine DEP has actively participated in the planning, implementation, and assessment of the OU1 RI/FS. Maine DEP has partnered with EPA in the implementation of the cleanup action

at the Site. Maine DEP has notified EPA that it concurs with the cleanup approach presented in this ROD (Appendix B).

9. Community Acceptance.

EPA has worked closely with the community during the entire OU1 RI/FS. Numerous public meetings and fact sheets have been released to provide the public with a solid understanding of the Site conditions. The cleanup alternatives reflect the community input. In particular, significant efforts were made to identify cleanup approaches that would minimize truck traffic.

EPA provided a 30 day extension to the comment period to accommodate the community interest in having more time to evaluate the cleanup plan. The community is generally supportive of the cleanup action as documented by the comments provided in support of the cleanup. In particular, a majority of the comments support removing mine wastes from Dyer and Goose Coves as part of wetland mitigation for the selected remedy. The majority of the comments were in favor of the cleanup, emphasizing that they wished the cleanup to be initiated as soon as possible. A few commenters requested that the cleanup be limited to the PCB hot spot and residential yards due to financial considerations and concern that there was insufficient ecological risk demonstrated to justify the components of the remedial action that address protecting aquatic resources.

L. THE SELECTED REMEDY

1. Summary of the Rationale for the Selected Remedy

The selected remedy for the Callahan Mine Superfund Site is the first remedy for the Site. The selected remedy targets the principal threat waste, which is the PCB contaminated soil at the Mine Operations Area. The selected remedy will protect human health by eliminating exposure to PCBs, arsenic, and lead above levels acceptable for residential contact. The selected remedy will isolate the waste rock from the Ore Pad and Mine Operations Area to remove a major source of groundwater and surface water contamination. The selected remedy will also remove WRP-3 and contain the Tailings Impoundment to remove the source of the seeps that may be responsible for the dead wetland vegetation and are a major source of surface water and sediment contamination. The selected remedy will stabilize the Tailings Impoundment to prevent a future slope failure that could release large quantities of tailings into Goose Pond. The selected remedy will remove contaminated sediments from the biological active zone and isolate these sediments in the CAD cell in the former mine pit to significantly reduce the risk to the benthic community, piscivorous birds, and insectivorous birds. The remaining waste at the Site is characterized as large volume, low level threat waste that is causing ecological impacts to surface water and sediments. Mine sediments present in Dyer and Goose Coves will be removed and disposed of in the CAD cell as part of wetland mitigation for the selected remedy. Long-term O & M, monitoring, and institution controls will ensure the long-term protectiveness of the remedy. The selected remedy is the proposed preferred alternative as identified in the OU1 Proposed Plan and presented in more detail in the OU1 Feasibility Study Report.

2. Description of Remedial Components

<u>Alternative CMS2</u> – Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, and WRP-3), Residential Use Area Soil, and Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

The selected remedy for OU1 will consist of the following key components:

- Pre-design Investigations and Studies;
- Tailings Impoundment Cover System with stabilization measures, possibly including a toe shear key or buttress;
- Development of an on-site quarry to supply material for the Tailings Impoundment Cover System;
- Horizontal drain, or other drainage methods (e.g. vertical wells or drains), within Tailings Impoundment and passive treatment of the discharge from the horizontal drain, or other drainage methods (e.g. vertical wells or drains), in a constructed wetland;
- Excavation and subaqueous disposal of WRP-3, Ore Pad, and Mine Operations Area source material in the CAD cell in the former mine pit;
- Excavation of soil containing arsenic and lead above the cleanup levels in the Residential Use Area of the Site and subaqueous disposal in the CAD cell in the former mine pit;
- Excavation and off-site disposal of PCB-contaminated soil exceeding Site specific PCB cleanup levels identified in Table 57;
- Excavation and off-site disposal of petroleum-contaminated soil commingled with CERCLA waste;
- Dredging of Goose Pond and salt marsh sediment exceeding Site specific sediment cleanup levels identified in Table 58 and subaqueous disposal in the CAD cell in the former mine pit;
- Establishment of institutional controls to protect the components of the remedy (including caps, treatment wetlands, monitoring well, and the CAD cell);
- Mitigation, restoration, and compensation for wetland impacts, including the dredging and subaqueous disposal of Dyer Cove and Goose Cove sediments that contain mine waste in the CAD cell in the submerged former mine pit, along with other measures that may be identified in remedial design;
- Installation of monitoring wells;
- Long-term operation and maintenance; and monitoring; and
- Five-year reviews.

Figure 19 is an alternative remedy map showing the major components of the selected remedy for OU1.

Pre-Design Investigations and Studies

A series of pre-design studies will be performed to support the design of the selected remedy for OU1. Examples of pre-design that may be performed are listed below:

- Topographic survey;
- Pre-excavation sampling to refine estimates of the extent of PCB contamination at the Mine Operations area;
- Pre-dredge sampling to refine estimates of the extent of sediment contamination exceeding Site specific sediment cleanup levels;
- Pre-excavation sampling to refine estimates of the extent of petroleum contamination at the Mine Operations area;
- Pre-excavation sampling to better define the extent of arsenic, lead, and thallium within the Residential Use Area and to further define the background concentration of arsenic for the Site area;
- Geotechnical pre-design investigation(s) to support the design of the Tailings Impoundment stabilization measures;
- Borings within the Tailings Impoundment to characterize physical properties and spatial variability of tailings in cut/fill areas (excavations, construction traffic, settlement, dewatering, etc.);
- Borings along and adjacent to the toe of the Tailings Impoundment berm to characterize physical properties and spatial variability of estuarine deposits and native clay soils (long-term and short-term global stability evaluations, design of toe improvements, etc.);
- Borings along and adjacent to the toe of WRP-3 to characterize estuarine deposits and native clay soils (short-term global stability evaluation, construction-related issues, etc.)
- An assessment of wetland mitigation requirements and design options that may be required, in addition to the removal of mine waste from Goose Cove and Dyer Cove, to ensure compliance with ARARs;
- An assessment of dredging/excavation technologies for the removal of contaminated sediments;
- An assessment of methodologies for transporting and disposal of contaminated material into the CAD; and
- Bench scale and pilot scale testing of the wetland treatment system to confirm that the design concepts can be successful based on the Site specific conditions.

Tailings Impoundment Cover System and Stabilization Measures

The selected remedy for OU1 will include regrading the tailings surface and berm to reduce modeled instability beneath and immediately behind the berm that could contribute to berm failure, and installing a low-permeability cover system. Additional measures, including a shear key or buttress will be included if determined necessary during the design. The cover system will include diversion of surface water along its western edge to reduce the amount of

upslope runoff potentially infiltrating under the edge of the cover system and infiltrating the Tailings Impoundment. The existing access road along the toe of the Tailings Impoundment berm will be retained and connected with the WRP-3 Haul Road after removal of WRP-3 to provide construction, maintenance, and long-term inspection/monitoring access to the area along the toe of the tailings impoundment berm.

The re-contoured surface will be capped with a low-permeability cover system to minimize infiltration/recharge and prevent human and ecological receptor contact with exposed tailings. The conceptual cover system is shown in Figure 21. The final components will be determined during the design. The concept presented in the OU1 Feasibility Study Report includes the following components, from bottom to top: a 12 inch cushion layer consisting of either regraded tailings or crushed stone with a maximum stone size of ½-inch diameter; a 40-mil geomembrane; a geocomposite drainage layer; and approximately 15 inches of crushed stone. The design, however, will determine the actual thickness of the geomembrane most appropriate for a stone cover, and whether a geosynthetic cushion will be needed to protect the geomembrane against puncture. The design process will also include an evaluation of the necessity of placing a geosynthetic clay liner (GCL) beneath the geomembrane for enhanced long-term performance. The crushed stone will be obtained on-site by quarrying inert rock from the area west of the Ore Pad Haul Road and crushing it. This on-site quarrying and crushing approach was chosen to minimize the amount of heavy-truck traffic bringing material onto the Site over the narrow and twisting local roads. The estimated volume of required crushed stone is 53,400 cubic yards. The quarried area will be restored at the end of the remediation, based on applicable State quarry reclamation standards. On-site quarrying will eliminate the equivalent of 3,814 truck loads of material being hauled on local roads. A vegetative layer on the cover system is not being proposed in order to eliminate truck traffic needed to import large volumes of soil/loam.

With a low-permeability cover to reduce infiltration, the seepage of contaminated groundwater along the toe of the Tailings Impoundment berm is expected to decrease as groundwater within the Tailings Impoundment slowly drains. To further reduce adverse impacts on Goose Pond surface water and salt marsh areas, a horizontal drain, or other drainage methods (e.g., vertical wells or drains), will be installed within the Tailings Impoundment. Internal drainage will provide several benefits compared to the capture of water in the ditch at the toe of the berm outside of the Tailings Impoundment. The drain will provide several benefits compared to the capture of surface water in the ditch at the toe of the berm: it will reduce the estimated time needed to dewater the Tailings Impoundment by about a third; it will improve the capture of tailings drainage and reduce the capture of run-off; and it will reduce the amount of water requiring subsequent treatment.

A passive treatment system using an anaerobic wetlands system will be used to treat the water from the horizontal drain, or other drainage methods (e.g., vertical wells or drains). A pilot-scale treatability test will be implemented to evaluate the feasibility of using this treatment option. Up to approximately one acre appears available northeast of the Tailings Impoundment, while perhaps two acres are available within the former Callahan Mine property boundary at the southeast corner, for the placement of the wetland treatment system and storm water basins. Use

of either area will require clearing and excavating of land, some of which is existing wetland. Other on-site treatment options for the tailings drainage will be evaluated during design.

Excavation and Off-Site Disposal of PCB-Contaminated Soil and Petroleum Contaminated Soil

Soil with PCBs exceeding a concentration of 1 ppm will be excavated and segregated in temporary stockpiles for testing prior to disposal. An estimated 2,197 cubic yards of soil exceed 1 ppm of PCBs, which includes an estimated 220 cubic yards of soil with concentrations equal to or greater than 50 ppm. Excavated material with PCB concentrations equal to or greater than 50 ppm will be disposed of in a hazardous waste landfill permitted for PCB disposal (or at a PCB disposal facility approved under 40 C.F.R. Part 761). Some or all of this material could be treated off-site, prior to disposal, if required. Excavated material with concentrations above 1 ppm but less than 50 ppm will be disposed of at an appropriate off-site facility. Petroleum-contaminated soil with DRO/GRO exceeding the Maine remediation goals (DRO, 10 mg/kg; GRO, 5 mg/kg) for oil-contaminated soil at Stringent Sites and commingled with CERCLA waste will be excavated for off-site disposal. Current estimates are that up to 600 cubic yards of soil contain DRO/GRO above these concentrations. Excavation of oil-contaminated soil will occur as part of the larger excavation of the Mine Operations Area and separate backfilling of the excavation is not planned. The areas that will be excavated for PCBs and petroleum contamination are shown on Figures 12 and 19.

Excavation and Disposal of WRP-3, Ore Pad, and Mine Ops Area Source Material in a CAD Cell in the Former Mine Pit

Source material for groundwater contamination and surface runoff contamination with metals at WRP-3 (including portions of the WRP-3 Haul Road), Ore Pad, and Mine Operations Area will be excavated and subject to subaqueous disposal in a CAD cell in the former mine pit. These areas are shown in Figure 19. Horizontal boundaries for the excavation will be delineated based on interpretation of OU1 RI data as to the areas with the greatest potential to contribute to groundwater and surface water contamination. In addition, a 200-foot-wide strip at the western edge of WRP-2 between the Ore Pad and the Mine Operations Area will also be excavated. The vertical limit of excavation will be based on the cleanup levels established for the recreational exposure. These cleanup levels have been chosen with the goal that these areas will not require further remediation under OU2. Excavation will be performed with conventional earth moving equipment. Excavated material will most likely be transported to the mine pit by a combination of trucks and a floating conveyor system to deliver material to the approximate center of the pit. If fill material is needed as subgrade material for the Tailings Impoundment cap, some material designated for disposal in the mine pit may be used under the cap. The estimated volume to be excavated are: 44,000 cubic yards for the Mine Operations Area; 16,000 cubic yards for the Ore Pad; and 216,000 cubic yards for WRP-3. The disposal of the source material into the CAD cell and long-term monitoring of the protectiveness CAD cell will meet all applicable standards under the Clean Water Act and other identified ARARs for protecting the aquatic resources of Goose Pond.

Excavation of Residential Use Area Surface Soil and Disposal in a CAD Cell in the Former Mine Pit

Surface soil exceeding the cleanup levels for residential exposure at residential lots along Old Mine Lane will be excavated to a depth at which cleanup level exceedances no longer occur, and will be disposed in the CAD cell in the former mine pit. The lots within the Residential Use Area that will be subject to the selected remedy are shown in Figures 15 and 19. If fill material is needed under the Tailings Impoundment cap, some material designated for disposal in the mine pit may be used under the cap. At the completion of the remediation, the area will be available for unrestricted residential use based on the lack of any CERCLA risk from soil contamination. Groundwater risks will be evaluated as part of OU2. The estimated volume of material to be removed in the Residential Use Area is 5,000 cubic yards. The disposal of the contaminated soil into the CAD cell and long-term monitoring of the protectiveness CAD cell will meet all applicable standards under the Clean Water Act and other identified ARARs for protecting the aquatic resources of Goose Pond.

Dredging of Sediment Hot Spots in Southern Goose Pond and the Adjacent Salt Marsh Sediment and Disposal in a CAD Cell in the Former Mine Pit

The sediments exceeding the cleanup levels, identified in Table 58 of this ROD, that are located in Southern Goose Pond and the adjacent salt marsh will be dredged and disposed in the CAD cell in the submerged former mine pit. An estimated volume of 52,000 cubic yards from Goose Pond and 23,000 cubic yards from the salt marsh of mine waste contaminated sediment will be dredged and disposed in the CAD cell in the submerged former mine pit. An additional 17,000 cubic yards of Dyer Cove and 10,000 cubic yards Goose Cove of mine waste contaminated sediments will also be dredged and disposed in the CAD cell in the submerged former mine pit as part of wetland mitigation activities. The OU1 FS assumed the use of a hydraulic dredge that pumps dredged material directly to the mine pit through high-density polyethylene piping. This will eliminate the need for on-shore handling, dewatering, and the construction of an upland confined disposal facility. A drop tube will be used to lower the actual discharge point and reduce entrainment of material in the upper portion of the water column. Silt curtains will be placed, as necessary, around the mine pit to reduce the potential for turbid water to migrate to other areas of Goose Pond. Proper selection and operation of dredge equipment, along with water quality monitoring will help minimize migration of suspended material from the dredge site. In addition, silt curtains will be used, as appropriate, to minimize migration of suspended material from the area being dredged. It may be necessary to manage water levels in Goose Pond to permit access by a dredge into the upper, shallow areas of the pond. Any negative impacts from maintaining water levels for an extended period during dredging operations will be evaluated and impacts mitigated, if necessary. The areas to be dredged in Goose Pond, the salt marsh, Dyer Cove, and Goose Cove are shown in Figure 19.

Dredged material will be placed below the mixing boundary in the former mine pit to prevent long-term contamination of surface water in the remainder of Goose Pond. Information gathered during the OU1 RI identified a mixing boundary within the 300-foot deep mine pit about 30 feet below mean sea level. Water below this boundary does not mix with the upper

waters of Goose Pond. Source material placed below this boundary will not be expected to contaminate surface water in the remainder of Goose Pond. The available data indicate that the mine pit can hold up to 1,300,000 cubic yards of source material and dredged sediment without filling above the mixing boundary. This is more than adequate to hold the estimated 101,000 cubic yards of sediment and 347,000 cubic yards of source material and soil identified for disposal in the former mine pit. This volume will only fill the pit to an estimated depth of 120 feet below sea level. The estimated level of fill in the mine pit after implementation of the selected remedy for OU1 is shown in Figure 21. The disposal of contaminated sediments into the CAD cell and long-term monitoring of the protectiveness CAD cell will meet all applicable standards under the Clean Water Act and other identified ARARs for protecting the aquatic resources of Goose Pond.

Backfilling of dredged areas in Goose Pond is not planned. This is primarily because the mine waste has artificially filled Goose Pond and its removal will partially re-establish the pre-mine hydrology. The salt marsh, excavated or disturbed during remedial activities, will be restored and any permanent loss of area or function will be included in the wetland mitigation component of the cleanup.

Mine Waste and Sediment Waste Disposal in the Submerged Former Mine Pit in Goose Pond

The submerged former mine pit in Goose Pond (the Pit), as a potential receiving area for confined aquatic disposal (CAD) cell of mining waste and contaminated sediments, was evaluated to verify compliance with the Clean Water Act (CWA) Section 404, potential for exceedances of CWA Water Quality Criteria (WQC) and protectiveness under CERCLA. For Superfund sites, as an ARAR, Section 404 of the CWA governs the placement of contaminants and pollutants into waters of the United States as an applicable regulatory requirement. Section 403 of the CWA, which governs placement of waste and pollutants into the ocean environment (specifically, the territorial sea, the water of the contiguous zone, or the oceans), is neither an applicable nor a relevant and appropriate requirement because data show that waste contaminants to be placed in the CAD cell will not leak into the bay and ocean waters of the United States.

The technical evaluation of the CAD cell made the following findings that are unique to the situation at the former Callahan Mine Pit and ensures that waste placement in the CAD cell will remain protective of human health and the environment and will comply with applicable, or relevant and appropriate requirements (ARARs).

Overarching Determination under CWA 404:

- The receiving water body is not deemed a special aquatic site under Clean Water Act 404, as defined in 40 C.F.R. § 230.3(q-1) and Subpart E of the "Section 404 (b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material" at 40 C.F.R. §§ 230.40-230.45.
- *Sufficient information is available to demonstrate that disposal in the CAD cell will* comply with Clean Water Act 404.

- Disposal of the mine waste and contaminated sediment in the CAD cell will not discharge to the ocean, nor will it result in adverse impacts to the aquatic system, ecological community, groundwater, or surface water.
- Disposal of the mine waste and contaminated sediments in the CAD cell will not result in exceedances of State or Federal Water Quality Criteria or groundwater standards.
- Disposal in the CAD cell is protective of human health and the environment and provides less environmental impact than other potential remedies.
- Land based disposal would result in a loss of habitat and could potentially continue to act as a contaminant source to surface, groundwater other media at the site.
- Land based disposal will result in the need for continued management of mine waste leachate to prevent contamination to other media.

Technical Analysis of Waste Disposal in the CAD Cell:

- The CAD cell uses the former mine pit, and is entirely submerged and below sea level.
- Disposal in this CAD cell is different from an ocean disposal where waste materials cannot be confined and controlled due to tidal influences along with uncontrolled navigation and marine life disturbance activities.
- Disposal in this CAD cell is also different from disposal into a fresh water lake or body, as those waters are non-saline and could be used as drinking water sources. Furthermore, fresh water lakes may have sediment disturbance due to tidal influences, navigation, and aquatic life disturbance activities.
- The placement of the sediment and waste rock into the CAD cell within the confines of the submerged former mine pit will isolate the material from oxygen and from the pond's biota.
- The pit extends 300 feet down into solid bedrock that will not release contaminants to groundwater or the adjacent and surrounding bay and ocean waters.
- While the pit is hydrogeologically connected to groundwater, monitoring data has not shown evidence of mine related waste leaching from the pit.
- The mine waste and contaminated sediment along with the marine water in the CAD cell have significant alkalinity and will minimize acid generation and leaching into and around the CAD cell.
- Sampling of the lower pit shows that it contains sufficient quantities of hydrogen sulfide such that it will prevent the metals in the waste from mobilizing. Additionally, placing these wastes into the anaerobic environment of the CAD cell will also alter the oxidation state of the metal contaminated mine waste which will further minimize waste from mobilizing into the environment.
- The current pit bottom has mine waste that contains contaminants at levels consistent with the mine waste that will be placed in the pit.
- If marine waters were to infiltrate the CAD cell, the marine water would have sufficient alkalinity such that it would minimize acid mine waste generation and release of heavy metals.
- If releases were to occur, the groundwater beneath the bedrock is saline and is not hydraulically connected to groundwater that constitutes a drinking water aquifer as

defined by the "EPA Guidelines for Ground-Water Classification" (1986 Federal Guidelines) (Final Draft, December 1986).

- Current groundwater monitoring data demonstrate that there is no evidence that the pit has released contaminants to groundwater below or surrounding the pit.
- Currently the contaminant levels in the surface water exceed Water Quality Criteria. However, mine waste and sediment disposal in the CAD will not result in further contaminant releases to the surface water that will further degrade the water quality because of the sediment cap and the alkaline environment of the pit waters.
- Studies conducted on the subsurface conditions of the water body demonstrate that the top of the waste disposal cap will not be subject to scouring conditions.
- If materials were to leach out of the waste, the CAD cell will be located below the thermocline which provides a natural impediment to contaminants reaching the surface water. Historical data shows the thermocline to be stable.
- Waste placement in the CAD cell can be accomplished such that there is minimal to no mixing with the surface water above the thermocline.
- A subaqueous cover consisting of adequate clean sediments will be placed in the CAD cell to provide a quality bottom substrate that prevents biota uptake of metals and minimizes the flux of dissolved metals that could impact surface water.
- Disposal of the mine waste and sediment waste in the CAD cell restores the pit area to closer to pre-mining grade.
- As part of the remedy, EPA will monitor the groundwater upgradient and downgradient of the CAD cell and surface water to verify that that release of contaminants are not occurring.

Wetland Mitigation

Implementation of the selected remedy will result in alteration of upland Wetlands B, C, D, and E; coastal wetlands; and subtidal wetlands. The levels of compensatory wetland mitigation will be established during the design. One component of wetland mitigation that will be implemented is to remove the mine waste deposits from Goose Cove and Dyer Cove and place that material in the CAD cell in the former mine pit to allow these areas to be restored to depth and habitat type comparable to pre-mining conditions. Removal of this material will also reduce the contaminant levels in those areas. Figure 22 shows the wetland areas that may be impacted by the selected remedy.

Institutional Controls

As part of the selected remedy, institutional controls, such as deed restrictions on upland areas and dredge/disturbance restrictions within State-owned subtidal areas, will be implemented to prevent any disturbance of the components of the remedy, including the Tailings Impoundment cover system, treatment wetland, monitoring wells, and the CAD cell in the former mine pit.

Long-Term Operation, Maintenance, and Monitoring

Anticipated maintenance activities include: maintenance of the low-permeability cover system at the Tailings Impoundment; maintenance of storm water diversions and drainage structures to prevent/repair erosion damage; possible removal of contaminated media and the addition of clean material to the treatment wetland, as necessary; possible repair of reconstructed salt marsh; and repair/replacement of damaged monitoring wells. A long-term monitoring plan will be developed to evaluate the success of the cleanup actions. This plan will include groundwater, surface water, sediment, and biota monitoring, and will also collect data to support the Five-Year Reviews. At least yearly inspections of the Site and verification that the proper notices and restrictions are in place at the local governmental offices and that restrictions are being enforced will also be included to verify that the institutional controls have not been violated.

Five-Year Reviews

Under Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), any remedial action that results in contaminants remaining on-site at concentrations above those allowing unlimited exposure and unrestricted use must be reviewed at least once every five years. Five-year reviews will be performed to determine whether the implemented OU1 remedy continues to be protective of human health and the environment, or whether the implementation of additional remedial action is appropriate.

Summary of Costs

The total costs for the cleanup action is presented in Table 56 below. Detailed cost estimates for capital and long-term costs are presented in Table 4.2-6 and Appendix G of the OU1 Feasibility Study Report.

Table 56
Cost Summary for Selected Remedy (Alternative CMS2)

CAPITAL COSTS	COST	
Pre-Design Studies	$310,000	
General Construction Costs Common to all Components of Work	$827,000	
Tailings Impoundment Improvements	$4,331,000	
Waste Rock Pile No. 3 (WRP3)	$3,002,000	
Ore Pad and Mine Operations Area (Mine Ops, Etc.)	$694,000	
Residential Lots	$314,000	
PCB Soils	$587,000	
Sediment Dredging of Goose Pond and salt marsh	$2,124,000	
Wetland Mitigation, including Goose Cove and Dyer Cove	$1,245,000	
Institutional Controls	$31,000	
Monitoring Well Installation	$66,000	
Long-term Monitoring Plan	$35,000	
Direct Cost Subtotal		$13,566,000
Contingency Cost (@30 Percent)		$4,069,800
Direct and Contingency Cost Subtotal		$17,635,800
Indirect Capital Costs (Engineering, Design, Construction and Project Mgmt)		$3,880,000
TOTAL CAPITAL COSTS		**$21,515,800**
Total Long Term Operation, Maintenance and Monitoring for 30 years at 7% discount rate		$1 ,324,000
Total Capital and Long Term Operation, Maintenance and Monitoring for 30 years at 7%		**$22,839,800**

Total Long Term Operation, Maintenance and Monitoring in nominal costs for 100 years at 2.7% discount rate would be $3,398,000 and nominal costs for 100 years would be $9,718,000.

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. A 7% discount rate was used to estimate present worth for the selected remedy. Costs are also presented for a 2.7% discount rate and for the nominal (non-discounted cost). Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Difference (ESD), or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

3. Expected Outcomes of the Selected Remedy

The selected remedy for OU1 will eliminate the current human health risk from exposure to PCBs in the former Mine Operations area and the risk from exposure to lead and arsenic in residential properties by removal of this material. This will allow for unrestricted use of the residential properties. The removal of the PCBs to less than 1 mg/kg will allow for unrestricted

use of the Site and the removal of lead, arsenic and thallium from the residential area will allow unrestricted use of that area of the Site. However, the lead and arsenic remaining on the former Callahan Mine property at the end of the OU1 cleanup will be above levels that will be protective for residential exposure (greater than 150 days per year)[5]. The OU2 human health risk assessment will formally evaluate whether any additional action is necessary to allow for long-term recreational use of the Site. The long-term use of the former Callahan Mine property within the Site, based on current use and the reuse assessment, is for limited recreational use that may involve boating (canoe/kayak) on Goose Pond, scenic viewing from the top of WRP-1, geologic exploration, or other similar activities. This is compatible with the adjacent Holbrook Island Sanctuary and the objectives of the Smith Cove Preservation Trust, the current owner of the former Callahan Mine property. The future use of the residential areas will continue to be for residential use.

Removal of the waste in the Ore Pad and Mine Operations Area will eliminate a major source of groundwater contamination. A reduction in the concentrations of contaminants in the groundwater should be observed following removal of these areas. The OU2 RI/FS will evaluate whether this initial source reduction will be sufficient to accomplish the cleanup of the groundwater or if other response actions are necessary.

The selected remedy for OU1 will also result in the removal of the mine waste with high concentrations of copper, lead, and zinc from Goose Pond and the adjacent salt marsh. This material is a threat to the benthic community, birds, and fish. Removal of this material will result in an immediate improvement to the Site biota as the contact and ingestion of this material was a primary basis for the threats to the benthic community and birds. Furthermore, removal of mine waste from Dyer and Goose Coves, as part of wetland mitigation activities will also remove a significant volume of contaminants from the aquatic system. Over time, the elevated metal levels in the Site biota are expected to decline, which will result in a reduction of the trophic transfer of the contamination. The removal of the contaminated mine waste will also allow for the restoration of Goose Pond to a condition that promotes better tidal flow. The removal of source material from WRP-3, Ore Pad, and Mine Operations Area will reduce the contaminant load to Goose Pond as will the capping of the Tailings Impoundment. Once the OU1 sediment cleanup is completed, an evaluation will be conducted as part of OU2 to determine if remnant sediment contamination from the Site poses any human health risk, particularly from the ingestion of fish and/or shellfish from the waterbodies.

EPA's new Cancer Guidelines and Supplemental Guidance (March 2005) will be used as the basis for EPA's analysis of all new carcinogenicity risk assessments. If updated carcinogenicity risk assessments become available, EPA will determine whether an evaluation should be conducted as part of the remedial design to assess whether adjustments to the target cleanup levels for this remedial action are needed in order for this selected remedy to remain protective of human health. Once the remedy is completed any revised risk or ARAR standards will be evaluated through the Five-Year Review process.

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[5] The Early Action for OU2 will impose land use restrictions to limit future use of the former Callahan Mine property portion of the Site to non-residential use.

a. Soil Cleanup Levels

For the Residential Use Area of the Site, the cleanup levels were set at a level that will be acceptable for residential exposure. For the OU1 cleanup areas within the former Callahan Mine property portion of the Site, the recreational use cleanup levels will be used to determine the clean soil level within the limits of the source area removal for the Ore Pad, Mine Operations Area, and WRP-3.

Table 57
Clean Levels for Soil

	Back-ground (mg/kg)	Soil Cleanup Level (mg/kg)	Basis	Risk at Cleanup Level HQ / ELCR
Residential Cleanup Level				
Arsenic	14	14	Background	HQ = 0.2 ELCR = 5.8×10^{-6}
Lead	37	375	Maine State Safe Lead level and site-specific IEUBK model output	Using this level as the maximum concentration, then 95% of exposed population should have a blood lead level that does not exceed 10 µg/dl based on this cleanup level.
Polychlorinated biphenyls	Not applicable	1	TSCA and site-specific risk basis to allow for unrestricted future use	HQ = 0.4 ELCR = 1.9×10^{-6}
Thallium	0.12	15	Site-specific risk basis for noncancer exposure	HQ = 1 ELCR = n.a.
				HI = 1.6 Cumulative ELCR = 7.7×10^{-6}
Recreational Cleanup Level				
Arsenic	14	30	Risk-management decision to accept 1×10^{-5} ELCR for arsenic	HQ = 0.2 ELCR = 1.2×10^{-5}
Lead	37	700	Maine Remedial Action Guideline[1] and site-specific IEUBK model output	95% of exposed population should have a blood lead level that does not exceed 10 µg/dl based on this cleanup level.
Polychlorinated biphenyls	Not applicable	1	TSCA and site-specific risk basis to allow for unrestricted future use	HQ = 0.1 ELCR = 0.8×10^{-6}
				HI = 0.3 Cumulative ELCR = 1.2×10^{-5}

Notes:
All concentrations = mg/kg
HI = hazard index,
HQ = hazard quotient;
ELCR = excess lifetime cancer risk
[1] Maine DEP, Implementation of Remedial Action Guidelines, Table 4 – Remedial Action Guidelines for Contaminated Soils

b. Sediment Cleanup Levels

The sediment cleanup levels were set at a level that will be protective of the Site biota based on the OU1 RI and BERA. The copper and lead cleanup levels were set using the food chain models. The cleanup level is a concentration that represents the lowest adverse effect level

(LOAEL). The cleanup level for zinc was based on the benthic community toxicity tests and pore water data.

Table 58
Sediment Cleanup Level

Chemical of Concern	Goose Pond Background Level (mg/kg)	Salt Marsh Background level (mg/kg)	Cleanup Level for Sediment (mg/kg)	Basis
Copper	21	18	790	Ecological Effect – Set at a level that would not exceed a LOAEL of 1. The lower of LOAELs for G.B. heron or S. sandpiper
Lead	27	26	710	Ecological Effect – Set at a level that would not exceed a LOAEL of 1.Ecological Effect - Lower of LOAELs for G.B. heron or S. sandpiper
Zinc	98	91	5100	Ecological Effect – Set at a level that would protect the Benthic Macroinvertebrate Community from acute effects (mortality) based on the Dose-Response Value – High

M. STATUTORY DETERMINATIONS

The remedial action for OU1 selected for implementation at the Callahan Mine Superfund Site is consistent with CERCLA and, to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, will comply with ARARs, except for when waived, and is cost-effective. In addition, the selected remedy utilizes permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practicable. The selected remedy is not able to achieve the statutory preference for treatment as a principal element of the remedy (i.e., reduce the toxicity, mobility, or volume of materials comprising principal threats through treatment) due to site conditions and the balancing of all of the CERCLA criteria for selecting remedial alternatives. Some limited treatment of materials will occur as a result of the use of a wetland treatment system that will treat the discharge from horizontal drains, or other drainage methods, that will be used to facilitate the dewatering of the Tailings Impoundment.

1. The Selected Remedy is Protective of Human Health and the Environment

The selected remedy for OU1 at this Site will adequately protect human health and the environment by eliminating, reducing or controlling exposures to human and environmental receptors through treatment, engineering controls, monitoring, and institutional controls (i.e., land use restrictions).

The selected remedy will reduce potential human health risk levels such that they do not exceed EPA's acceptable risk range of 10^{-4} to 10^{-6} for incremental carcinogenic risk, and such that the non-carcinogenic hazard is below a level of concern. It will reduce potential human health risk levels to protective ARARs levels. Implementation of the selected remedy will not pose any unacceptable short-term risks or cause any cross-media impacts.

2. The Selected Remedy Complies With ARARs

The selected remedy will comply with all Federal and any more stringent State ARARs that pertain to the remedial actions (see Tables 59-61). In making this determination, EPA has made the following specific findings:

- Pursuant to regulations under the Federal Clean Water Act, 40 C.F.R. Part 230, Subpart B, EPA has made a determination that the remedy is the least damaging practicable alternatives with respect to potential wetland impacts and protecting wetland resources; and
- EPA has made a finding under the Toxic Substances Control Act (TSCA) PCB Regulations at 40 C.F.R. § 761.61 (c) that the cleanup level of 1 ppm established for PCBs at this Site will not pose an unreasonable risk of injury to health or the environment.

Location-Specific Applicable or Relevant and Appropriate Requirements

It is expected that the selected remedy can be designed and implemented to comply with all location-specific ARARs identified in Table 59. The most significant location specific ARARs are discussed below.

Section 404 of the CWA (33 U.S.C. § 1344), and regulations promulgated under the CWA, prohibit activities that adversely affect waters of the United States if a practicable alternative that has less adverse effect exists. If there is no other practicable alternative, adverse effects must be mitigated. Implementation of the selected remedy for OU1 (Alternative CMS2) would result in the dredging of subtidal sediment, excavation/dredging of salt marsh, and possibly the alteration of Federal jurisdictional freshwater wetlands. The temporary impacts on existing wetlands and aquatic habitats as part of this alternative is considered unavoidable. However, during remedial design, the effects of remedial activities on the wetlands and aquatic habitats will be evaluated to minimize damage consistent with Section 404(b) of the CWA and its promulgated regulations. The use of the submerged mine pit as a CAD cell is also regulated by these standards. Due to the size, depth, and hydoxic water quality within the pit, it provides a stable environment for the disposal of site wastes and can be filled and maintained so as to not impair wetland resources in the rest of Goose Pond. Furthermore, the removal of mine waste from Dyer and Goose Cove, as part of wetland mitigation for the Site, will meet mitigation standards established under Section 404(b) of the CWA.

In addition, freshwater wetlands that are regulated under Federal jurisdiction on Site may be affected by the remedial action. Freshwater wetlands that are contiguous to "waters of the United States" are Federal jurisdictional wetlands subject to Section 404 of the CWA. The extent of Federal jurisdictional wetlands that may be altered by the remedial action will be assessed and mitigation will be implemented, if necessary.

Additional Federal location-specific ARARs address coastal zone management, navigable waters, fish and wildlife habitat, and historic resources.

The Maine Natural Resource Protection Act (NRPA) (38 M.R.S.A. § 480-A *et seq.*) is one of the primary State location-specific ARARs for the Site. The NRPA establishes standards for the protection of the State's natural resources, including coastal wetlands, significant wildlife habitat, freshwater wetlands, and rivers, streams, or brooks. The Maine Wetlands Protection Rule (06-096 C.M.R. Chapter 310), promulgated under the NRPA, prohibits activities which would have an unreasonable impact on state-jurisdictional wetlands, with jurisdiction under the Wetland Rule extending for 75 feet upland of the upper edge of a protected wetland. Under the Wetland Rule, Wetlands of Special Significance include all coastal wetlands and certain freshwater wetlands which include: (a) significant wildlife habitat as defined by 38 M.R.S.A. § 480-B(10); (b) freshwater wetland areas located within 250 feet of a coastal wetland; (c) wetlands subject to flooding during a 100-year flood event; and (d) freshwater wetland areas located within 25 feet of a river, stream or brook. The Wetland Rule calls for the avoidance of activities that cause a loss in wetlands area, functions, and values if there is a practicable alternative that would be less damaging to the environment. If there is no practicable alternative, there must be minimal alteration of the wetland, and compensation (off-setting) may be required. As with the Federal wetland standards, mitigation to State wetland resources from the remedial action will be evaluated and implemented, if necessary. The removal of mine waste from Dyer and Goose Coves will be one of the activities implemented to meet State (as well as Federal) wetland mitigation standards.

Additional State location-specific ARARs address coastal zone management, facility siting requirements, shorelines, and submerged and intertidal lands.

Chemical-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered Guidances

Chemical-specific ARARs and TBCs triggered by the selected remedy for OU1 are presented in Table 60. There are no Federal chemical-specific ARARs for the Callahan Mine Superfund Site, but there are TBCs that were used to develop risk-based cleanup numbers for contaminants at the Site. The only State chemical-specific ARAR for the Callahan Mine Superfund Site is the Maine Solid Waste, Lead Management Regulations (06-096 C.M.R. Chapter 424). These regulations establish a lead safe standard of 375 ppm in bare soil in potential play areas, which would be achieved in the Residential Use Area, but not in other areas of the Site that are not used residentially. For areas that are not play areas, a level above 1,000 ppm is considered a lead hazard. The selected remedy would attain chemical-specific ARARS and TBCs by removing all lead-contaminated soil exceeding lead-safe levels in the residential area and disposing of it in the CAD cell, and meeting recreational risk levels for all soil contaminants throughout the rest of the Site.

Because OU1 does not include cleanup of groundwater, National Primary Drinking Water Regulation MCLs, Maximum Contaminant Level Goals (MCLGs), EPA Health Advisories, and MEGs for Drinking Water are not chemical-specific ARARs or TBCs[6].

Action-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered Guidances

Action-specific ARARs and TBCs that may be triggered by the selected remedy for OU1 are listed in Table 61.

Federal action-specific ARARs address the remediation of PCBs (Toxic Substances Control Act (TSCA), 40 C.F.R. § 761.61 (c)), discharge limits to surface waters, and monitoring standards for surface and groundwater. TSCA regulations provide cleanup and disposal options for PCB remediation waste based on the concentrations at which the PCBs are found and the risks the PCBs pose. USEPA has made a finding under the TSCA PCB Regulations at 40 C.F.R. § 761.61 (c), that the cleanup level of 1 ppm established for PCBs at this Site will not pose an unreasonable risk of injury to health or the environment.

It is expected that all components of the remedial action can be designed and implemented to comply with all Federal action-specific ARARs, including hazardous waste management and disposal, water discharge limits, and surface and groundwater monitoring requirements.

The primary State action-specific ARAR for the Site is the Maine Metallic Mineral Exploration, Advanced Explorations, and Mining regulation at 06-096 C.M.R. Chapter 200. In particular, Subchapter 5 - Mine Waste Treatment and Management, classifies mine waste and regulates the location, design, construction, operation, maintenance, closure, and long-term care for the treatment, storage, and disposal of mine wastes. USEPA has determined that these regulations, which were promulgated after Callahan Mine ceased operations, are not "applicable" to the Site, but are "relevant and appropriate." The following general performance standards are found at 06-096 C.M.R. Chapter 200, Section 32A:

- Meet the performance requirements for groundwater, surface water, air, and soils or surficial materials established under Section 26(I)
- Minimize acid generation and acid rock drainage
- Provide structural stability
- Protect public health and the environment
- Otherwise comply with applicable legal requirements

It is important to note that Subchapter 5 explicitly applies to mine waste in lieu of Maine Solid Waste Management Rules at 06-096 CMR 400-409 with the exception that land-clearing debris and wood waste are not considered mine waste for the purposes of the mining regulations.

[6] They are, however, cited as action-specific ARARs for groundwater monitoring of areas where waste will be capped in place.

In addition, mine waste is not considered hazardous waste to the extent that mine waste has been excluded by Section 3001(b)(3)(A)(ii) of the Resource Conservation and Recovery Act, 42 U.S.C. § 6921(b)(3)(A)(ii) (known as the Bevill exclusion) and Maine regulations at 06-096 C.M.R. Chapter 850, Section 3.A(3) and (4). Under these regulations, mining overburden returned to the mine site is not a hazardous waste. Furthermore the Maine regulations note that wastes from the extraction and beneficiation of metallic ores and minerals that are left on Site are regulated under Chapter 200 of Maine DEP rules, not Chapters 850-857. It is important to note that for any material that is sent off-site, applicable State and Federal waste management and disposal regulations would apply. Waste material could be considered a hazardous waste if testing revealed that it met certain characteristic criteria. The selected remedy for OU1 would be designed and implemented to attain the performance standards of the Maine Mining regulations, in particular preventing mine runoff from degrading surface and groundwater quality and stabilizing the berm around the sediment impoundment area.

Other State action-specific ARARs include those requiring control of erosion and sedimentation as a result of site activities; quarrying standards, management of storm water; monitoring and protection of surface water, groundwater, and air quality; and management of solid wastes.

3. The Selected Remedy is Cost-Effective

In EPA's judgment, the selected remedy for OU1 is cost-effective because the remedy's costs are proportional to its overall effectiveness (see 40 C.F.R. § 300.430(f)(1)(ii)(D)). This determination was made by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., that are protective of human health and the environment and comply with all Federal and any more stringent State ARARs, or as appropriate, waive specific ARARs). Overall effectiveness was evaluated by assessing three of the five balancing criteria – long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness – in combination. The overall effectiveness of each alternative then was compared to the alternative's costs to determine cost-effectiveness. The relationship of the overall effectiveness of the remedial alternative selected in this ROD was determined to be proportional to its costs, thereby representing a reasonable value for the money to be spent. The alternative selected for Remedial Action for OU1 is the least cost alternative among the alternatives considered that met the primary criteria.

4. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

Once the Agency identified those alternatives that attain or, as appropriate, waive ARARs, and that are protective of human health and the environment, EPA identified which alternative utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by deciding which one of the identified alternatives provides the best balance of trade-offs among alternatives in terms of: (1) long-term effectiveness and permanence; (2) reduction of toxicity,

mobility or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. The balancing test emphasizes long-term effectiveness and permanence and the reduction of toxicity, mobility and volume through treatment, and considers the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and State acceptance. The selected remedy for OU1 provides the best balance of trade-offs among the alternatives.

The selected remedy for OU1 provides the best balance of the five balancing criteria and other factors taken into consideration. It is the least expensive alternative that achieves protection of public health and the environment and complies with ARARs. None of the alternatives considered used treatment as a primary element to achieve any reduction of toxicity, mobility, or volume, although some limited treatment will occur through the use of treatment wetlands to treat the discharge from the horizontal drain, or other drainage method, that will be used to facilitate drainage of the Tailings Impoundment. Principal threat PCB waste will be excavated and sent to an off-site facility (potentially this waste could be treated off-site prior to disposal, if required). Containment of the waste was determined to be the most cost-effective approach to achieve long-term effectiveness and permanence, and treatment was not practical for the large quantity of low level threat waste. Short-term impacts associated with wetland resources, as well as community input regarding truck traffic, were taken into consideration. The long-term monitoring and five-year reviews will document that the protectiveness standards are being met. Maintenance of the remedial components along with monitoring and institutional controls will provide the long-term effectiveness.

5. The Selected Remedy Does Not Satisfy the Preference for Treatment Which Permanently and Significantly Reduces the Toxicity, Mobility or Volume of the Hazardous Substances as a Principal Element

The selected remedy relies on off-site disposal rather than treatment for the principal threat waste (PCBs) since the vast majority of PCB contaminated material is below EPA's guidance levels for treatment for PCBs and the quantity of PCBs materials is too small to warrant consideration of on-site treatment (potentially the waste could be treated off-site prior to disposal, if required). The major components of the remedy are source control measures for large volumes of low level threat wastes, which is consistent with EPA guidance. The wetlands treatment system would achieve some level of reduction in toxicity, mobility, and volume through treatment as a result of the sulfide reduction to immobilize the metals in the treatment matrix.

6. Five-Year Reviews of the Selected Remedy are Required

Because this remedy will result in hazardous substances remaining on-site above levels that will not allow for unlimited use and unrestricted exposure, a review will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

N. DOCUMENTATION OF NO SIGNIFICANT CHANGES

On July 9, 2009, EPA presented the OU1 Proposed Plan that described the cleanup proposal for the Callahan Mine Superfund Site. EPA reviewed all written and verbal comments submitted during the public comment period, which was open from July 10 to August 10, 2009. After a request from the public for more review time, the comment period was extended until September 10, 2009. It was determined, after reviewing the comments received that no significant changes to the remedy, as originally identified in the proposed plan, were necessary. The only minor change in the remedy from that presented in the Proposed Plan is that the removal of mine waste from Dyer and Goose Coves, which was presented as an optional wetland mitigation component of the remedy, has been made a component of the remedy that is no longer optional. This decision was based on further review of Federal and State wetlands mitigation and mine closure standards and broad public support. In addition, the ROD also provides more flexibility for the drainage of the Tailings Impoundment by including the possible use of other drainage measures in addition to or in place of the horizontal drain.

O. STATE ROLE

The State of Maine Department of Environmental Protection (Maine DEP) has reviewed the various alternatives and has indicated its support for the selected remedy. The State has also reviewed the OU1 Remedial Investigation, Risk Assessment and Feasibility Study with respect to the Site to determine whether the selected remedy is in compliance with applicable or relevant and appropriate State environmental and facility siting laws and regulations. The State of Maine concurs with the selected remedy for OU1 for the Callahan Mine Superfund Site. A copy of the declaration of concurrence is attached as Appendix B.

APPENDIX A
ARAR Tables and Figures

Table 59
Location-Specific ARARs for OU1 Remedial Action (Alternative CMS2)

Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, and WRP-3), Residential Use Area Soil, and Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Federal	Navigable waters	Rivers and Harbors Act of 1899 (33 U.S.C. § 403 *et seq.*; 33 C.F.R. Parts 320-323)	Relevant and Appropriate	Section 10 of the Rivers and Harbors Act prohibits unauthorized obstruction or alteration of navigable waters. No activity that impacts waters of the United States shall be permitted if a practicable alternative that has less adverse impact exists. If there is no other practicable alternative, the impacts must be mitigated.	Site activities will be designed and implemented to avoid obstruction and minimize alteration of navigable waters during dredging and CAD disposal. Disturbed areas may be restored.
Federal	Wetlands and aquatic habitats	Clean Water Act, Sec 404 (33 U.S.C. § 1344); Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 C.F.R. Parts 230 and 231 and 33 C.F.R. Parts 320-323)	Applicable	These regulations outline the requirements for the discharge of dredged or fill materials into surface waters including Federal jurisdictional wetlands. No activity that impacts waters of the United States shall be permitted if a practicable alternative that has less adverse impact exists. If there is no other practicable alternative, the impacts must be mitigated.	The dredging/excavation of Goose Pond sediments and salt marsh will result in the unavoidable destruction of existing Federal jurisdictional wetlands and aquatic habitats; although during remedial design the effects of remedial activities on the wetlands and aquatic habitats will be evaluated and minimized. Compensatory habitat mitigation will be performed, including the removal of mine waste from Dyer and Goose Coves to comply with this ARAR. The selected remedy (CMS2) has been identified as the least damaging practicable alternative as it achieves the remedial action objectives with the lowest degree of permanent wetland loss in the salt marsh and Goose Pond. Deposition of material into the CAD cell will also comply with these standards regarding the filling of aquatic habitats. The alteration of any freshwater Federal jurisdictional wetlands will also be addressed under these standards. A final determination of Federal jurisdiction and any additional wetland mitigation, beyond the Dyer and Goose Cove restorations, will be made during the predesign phase.

Table 59
Location-Specific ARARs for OU1 Remedial Action (Alternative CMS2)
Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, and WRP-3), Residential Use Area Soil, and Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Federal	Surface waters and wetlands	Fish and Wildlife Coordination Act (16 U.S.C. § 661 *et seq.*)	Applicable	This Act requires Federal agencies involved in actions that will result in the control of structural modification of any stream or body of water for any purpose, to take action to protect the fish and wildlife resources that may be affected by the action. USEPA must consult with appropriate Federal and State resource agencies to ascertain the means and measures necessary to mitigate, prevent, and compensate for project-related losses of fish and wildlife resources and to enhance the resources.	Measures to mitigate or compensate adverse project-related impacts to fish and wildlife resources will be taken, if determined necessary. The appropriate Federal and State resource agencies will be consulted.
Federal	Coastal zone	Coastal Zone Management Act (16 U.S.C. § 1451 *et seq.*)	Applicable	This Act requires activities in the designated coastal zone be conducted in a manner consistent with coastal zone management plans.	The substantive environmental requirements of this standard will be achieved.
Federal	Historic protection	National Historic Preservation Act of 1966 (16 U.S.C. § 470 *et seq.*); Protection of Historic Properties (36 C.F.R. Part 800)	Applicable	Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment.	Features with potential historical/cultural significance will be evaluated during the remedial design phase. Should this alternative impact historical properties/structures protected by these standards activities will be coordinated with the Advisory Council on Historic Preservation.
State	Natural resources	Maine Natural Resources Protection Act (NRPA) (38 M.R.S.A. §§ 480-A to 480-Z)	Applicable	The NRPA regulates activities affecting protected natural resources: coastal sand dune systems, coastal wetlands, significant wildlife habitat, fragile mountain areas, freshwater wetlands, great ponds and rivers, streams or brooks. The NRPA regulates the disposal of dredge spoil in coastal wetlands.	Remedial activities affecting regulated natural resources, particularly the alteration of coastal and freshwater wetlands from capping and dredging activities, as well as disposal in the CAD cell, will meet substantive environmental standards under the Act.

Table 59
Location-Specific ARARs for OU1 Remedial Action (Alternative CMS2)

Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, and WRP-3), Residential Use Area Soil, and Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
State	Wetlands	Maine NRPA, Wetlands Protection Rule (06-096 C.M.R., Chapter 310)	Applicable	The regulations prohibit activities which would have an unreasonable impact on wetlands (or within 75 feet of the outer boundary of the wetland) or cause a loss in wetland area, functions, and values. Under the Rules, "Wetlands of Special Significance" are defined as all coastal wetlands and great ponds as well as certain freshwater wetlands which include (a) Significant wildlife habitat, as defined by 38 M.R.S.A. § 480-B(10); (b) A freshwater wetland area located within 250 feet of a coastal wetland; (c) A freshwater wetland containing under normal circumstances at least 20,000 square feet of aquatic vegetation, emergent marsh vegetation or open water; (d) Wetlands subject to flooding during a 100-year flood event; and (e) A freshwater wetland area located within 25 feet of a river, stream, or brook. If there is no practicable alternative, there must be minimal alteration of the wetland and compensation (off-setting) may be required.	Function and value assessments will be performed, if necessary, for existing freshwater and coastal wetland/habitat, particularly any "Wetlands of Special Significance." The impacts associated with excavation of the sediments as part of this alternative are unavoidable and efforts will be made to minimize adverse effects on wetlands. Restoration actions will be taken to restore natural and beneficial values of the wetlands through the removal of mine wastes from Dyer and Goose Coves. A final determination of State jurisdiction and any additional wetland mitigation, beyond the Dyer and Goose Cove restorations, will be made during the predesign phase.
State	Wetlands Surface Waters	Maine NRPA, Permit-by-Rule Standards (06-096 C.M.R., Chapter 305)	Applicable	This rule prescribes standards for specific activities that may take place in or adjacent to wetlands and water bodies. The standards are designed to ensure that the disturbed soil material is stabilized to prevent erosion and siltation of the water.	Response actions will be performed to minimize impacts to freshwater and coastal wetlands or water bodies.

Table 59
Location-Specific ARARs for OU1 Remedial Action (Alternative CMS2)

Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, and WRP-3), Residential Use Area Soil, and Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
State	Shoreland areas	Maine Mandatory Shoreland Zoning Act (38 M.R.S.A. §§ 435-449; 06-096 CMR Chapter 1000)	Applicable	This Act protects and conserves shoreland areas by controlling activities within 250 feet of high water mark, as defined in State law.	Measures will be taken during selection, design, and implementation of remedial actions to comply with the substantive environmental requirements under the Act.
State	Subtidal, tidal, and filled tidal lands	Submerged and Intertidal Lands Act (12 M.R.S.A. §§ 1861-1867)	Applicable	The statute establishes the State's ownership and management of submerged, intertidal, and filled tidal land throughout the State.	The substantive environmental requirements of this standard will be achieved, including the development of land use restrictions for State submerged lands to protect the CAD cell, if required by the remedy.
State	Coastal zone	Coastal Management Policy Act (38 M.R.S.A. § 1801 *et seq.*)	Applicable	This Act provides for the regulation, conservation, beneficial use, and management of coastal resources.	The substantive environmental requirements of this standard will be achieved.
State	Facility siting	Maine Site Location of Development Law and Regulations (38 M.R.S.A. §§ 481-490. Also 06-096 C.M.R. Chapters 374 and 375)	Applicable	These regulations apply to control activities at certain developments so that there are minimal adverse impacts to natural resources, including erosion and sedimentation control, noise control, historic protection, and air quality control. Metallic mineral mining is designated as development of State or regional significance that may substantially affect the environment.	The selected remedy will comply with applicable environmental requirements. Storm water management, erosion and sedimentation controls, and traffic controls will be designed and implemented so that adverse effects on natural resources are minimized.

Notes:

ARAR = Applicable or Relevant and Appropriate Requirement
C.F.R. = Code of Federal Regulations
C.M.R. = Code of Maine Regulations
ME DEP = Maine Department of Environmental Protection
M.R.S.A. = Maine Revised Statutes Annotated
U.S.C. = United States Code
USEPA = U.S. Environmental Protection Agency

Table 60

Chemical-Specific ARARs and TBCs for OU1 Remedial Action (Alternative CMS2)

Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, WRP-3), Residential Use Area Soil; and Sediment in a Confined Aquatic Disposal (CAD) Cell in theFormer Mine Pit

Regulatory Authority	Chemical Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Federal Criteria, Advisories and Guidance	Soil and sediment	U.S. Environmental Protection Agency (USEPA) Risk Reference Doses (RfDs)	To Be Considered	RfDs are estimates of daily exposure levels that are unlikely to cause significant adverse non-carcinogenic health effects over a lifetime.	The selected remedy will meet these standards by removing contaminants that pose non-carcinogenic risks in the residential properties and disposing of them in the CAD cell or capping within the Tailings Impoundment and achieving recreational risk levels elsewhere in OU1.
Federal Criteria, Advisories and Guidance	Soil and sediment	Guidelines for Carcinogen Risk Assessment EPA/630/P-03/001F (March 2005)	To Be Considered	Guidance for assessing cancer risk.	The selected remedy will meet these standards by removing contaminants that pose carcinogenic risks in the residential properties and disposing of them in the CAD cell or capping within the Tailings Impoundment and achieving recreational risk levels elsewhere in OU1.
Federal Criteria, Advisories and Guidance	Soil, and Sediment	Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens EPA/630/R-03/003F (March 2005)	To Be Considered	Guidance for assessing cancer risks to children.	The selected remedy will meet these standards by removing contaminants that pose carcinogenic risks to children in the residential properties and disposing of them in the CAD cell or capping within the Tailings Impoundment and achieving child recreational risk levels elsewhere in OU1.
Federal Criteria, Advisories and Guidance	Soil and Sediment	USEPA Carcinogen Assessment Group, Cancer Slope Factors (CSFs)	To Be Considered	CSFs are used to compute the incremental cancer risk from exposure to site contaminants and represent the most up-to-date information on cancer risk from USEPA's Carcinogen Assessment Group.	The selected remedy will meet these standards by removing contaminants that pose carcinogenic risks in the residential areas and disposing of them in the CAD cell or capping within the Tailings Impoundment and achieving recreational risk levels elsewhere in OU1.

Table 60

Chemical-Specific ARARs and TBCs for OU1 Remedial Action (Alternative CMS2)

Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, WRP-3), Residential Use Area Soil; and Sediment in a Confined Aquatic Disposal (CAD) Cell in theFormer Mine Pit

Regulatory Authority	Chemical Medium	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain Requirement
Federal Criteria, Advisories and Guidance	Soil	Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil	To Be Considered	EPA guidance for evaluating the risks posed by lead in soil.	The selected remedy will meet this standard by excavating lead-impacted soil exceeding adult (and child) risk levels in the residential properties and disposing of the soil in the CAD cell or capping within the Tailings Impoundment. Lead contaminated soil elsewhere in OU1 will be cleaned up to recreational risk levels either by capping within the Tailings Impoundment or disposal in the CAD cell.
State	Soil	Maine Solid Waste Rules, Lead Management Regulations (06-096 C.M.R. Chapter 424]	Relevant and Appropriate	These regulations establish lead safe standards for soil containing lead – if lead in soil exceeds 375 parts per million (ppm) in bare soil in potential play areas or 1000 ppm in other than play areas, the soil in these areas shall be considered a lead hazard.	Lead contaminated soil in the residential properties that exceeds 375 ppm will be excavated and disposed of in the CAD cell or capped within the Tailings Impoundment so that it meets lead safe standards and permits unrestricted use.
State Criteria, Advisories and Guidance	Soil	Maine Voluntary Response Action Program, Remedial Action Guidelines for Hazardous Substances in Soil (May 20, 1997)	To Be Considered	These guidelines provide specific chemical concentrations determined by the ME DEP to be protective of human health under various direct exposure scenarios and protective of groundwater. State standards for cadmium are more stringent than Federal standards. These guidelines include standards for copper and zinc that do not have Federal standards.	The selected remedy will meet these standards by capping wastes that exceed these standards in the Tailings Impoundment area, treating runoff from the capped area in a treatment wetland, and disposing of all other contaminated soils and sediment exceeding these standards within OU1 in the CAD cell.

Notes:

ARAR=Applicable or Relevant and Appropriate Requirement
C.F.R. = Code of Federal Regulations
C.M.R. = Code of Maine Regulations
ppm = parts per million
CSF = Cancer Slope Factor
RfD = Risk Reference Dose
ME DEP = Maine Department of Environmental Protection
USEPA = U.S. Environmental Protection Agency

Table 61
Action-Specific ARARs and TBCs for OU1 Remedial Action (Alternative CMS2)
Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, WRP-3), Residential Use Area Soil; and Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

Regulatory Authority	Action	Requirement	Status	Requirement Synopsis	Actions to be Taken to Attain Requirement
Federal	Surface water discharge	Clean Water Act Section 402 National Pollutant Discharge Elimination System (NPDES) (40 C.F.R. §§ 122-125 and 131)	Applicable	This act and regulations establish discharge limitations, monitoring requirements, and best management practices. Point-source discharges of effluent to surface water must comply with NPDES requirements (e.g., Federal and State water quality criteria).	On-site discharges to surface waters, including Goose Pond and adjacent wetlands, shall meet these substantive discharge standards, particularly from the treatment wetland. These discharge limitations shall also be used to develop monitoring standards for surface waters.
Federal	Cleanup and disposal of polychlorinated biphenyl (PCB) remediation waste	Toxic Substances Control Act (TSCA); PCB Remediation Waste (40 C.F.R. § 761.61(c)	Applicable	This section of the TSCA regulations provides risk-based cleanup and disposal options for PCB remediation waste based on the risks posed by the concentrations at which the PCBs are found. Written approval for the proposed risk-based cleanup must be obtained from the Director, Office of Site Remediation and Restoration, U.S. Environmental Protection Agency (USEPA) Region 1.	The cleanup and off-site disposal of PCB contaminated soil will be performed in a manner to comply with TSCA. This ROD includes a finding by the Director, Office of Site Remediation and Restoration, EPA Region 1, that the PCB cleanup level selected will not pose an unreasonable risk to human health or the environment.
Federal	Cleanup and disposal of hazardous waste	Resource Conservation and Recovery Act (RCRA) (42 U.S.C. § 6901 *et seq.*), Subtitle C- Hazardous Waste Identification and Listing Regulations; Generator and Handler Requirements (40 C.F.R. Parts 260-262)	Applicable	Federal standards used to identify, manage, and dispose of hazardous waste. Maine has been delegated the authority to administer these RCRA standards through its State hazardous waste management regulations. These provisions have been adopted by the State.	Wastes generated as part of remedial activities that will be disposed of off-site (PCB and petroleum contaminated material, treatment wetland waste) will be characterized as hazardous or non-hazardous. If determined to be hazardous waste, then they will be managed in accordance with these standards.
Federal	Surface water quality	Clean Water Act (33 U.S.C. § 1251 *et seq.*); National Recommended Water Quality Criteria ("NRWQC") (40 C.F.R. § 122.44)	Relevant and Appropriate	These criteria were used to establish water quality standards for the protection of aquatic life.	These standards will be used for monitoring water quality during sediment/mine waste excavation/dredging; disposal of material into the CAD cell; monitoring of the discharge from the treatment wetland; long-term water quality monitoring of the Tailing Impoundment cap, treatment wetland, and CAD cell; and other remedial activities.

Table 61
Action-Specific ARARs and TBCs for OU1 Remedial Action (Alternative CMS2)
Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, WRP-3), Residential Use Area Soil; and Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

Regulatory Authority	Action	Requirement	Status	Requirement Synopsis	Actions to be Taken to Attain Requirement
Federal	Groundwater monitoring	Safe Drinking Water Act (42 U.S.C. § 300f *et seq.*); National primary drinking water regulations (40 C.F.R. Part 141, Subpart B and G)	Relevant and Appropriate	These regulations establish maximum contaminant levels (MCLs) for common organic and inorganic contaminants applicable to public drinking water supplies. MCLs were used as relevant and appropriate cleanup standards for aquifers and surface water bodies that are potential drinking water sources.	MCLs were used to establish standards for groundwater monitoring for the capped Tailings Impoundment area to assess the protectiveness of the cap.
Federal	Groundwater monitoring	Safe Drinking Water Act (42 U.S.C. § 300f *et seq.*); National primary drinking water regulations (40 C.F.R. 141, Subpart F)	Relevant and Appropriate	These regulations establish maximum contaminant level goals (MCLGs) for public water supplies. MCLGs are health goals for drinking water sources. These unenforceable health goals are available for a number of organic and inorganic compounds.	MCLGs were used to establish standards for groundwater monitoring for the capped Tailings Impoundment area to assess the protectiveness of the cap.
Federal	Groundwater monitoring	Health Advisories (Office of Drinking Water)	To Be Considered	Health Advisories are estimates of risk due to consumption of contaminated drinking water; they consider non-carcinogenic effects only. They are to be considered for contaminants in groundwater that may be used for drinking water where the standard is more conservative than either Federal or State statutory or regulatory standards. The Health Advisory standard for manganese is 0.3 mg/L.	Health Advisories were used to establish standards for groundwater monitoring for the capped Tailings Impoundment area to assess the protectiveness of the cap.
Federal Criteria, Advisories and Guidance	PCBs	EPA's Polychlorinated Biphenyl (PCB) Site Revitalization Guidance Under the Toxic Substances Control Act (November 2005)	To Be Considered	This guidance provides information on characterizing, cleaning up, containing, and disposing of PCB waste (e.g., soil and other debris generated as a result of any PCB spill cleanup) and guidance in complying with the PCB regulations at 40 C.F.R. Part 761.	The cleanup and off-site disposal of PCB contaminated soil will be performed in a manner to comply with TSCA.

Table 61
Action-Specific ARARs and TBCs for OU1 Remedial Action (Alternative CMS2)
Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, WRP-3), Residential Use Area Soil; and Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

Regulatory Authority	Action	Requirement	Status	Requirement Synopsis	Actions to be Taken to Attain Requirement
Federal Criteria, Advisories and Guidance	Generation of investigation derived waste	USEPA OSWER Publication 9345.3-03 FS, January 1992	To Be Considered	Management of Investigation-Derived Waste (IDW) must ensure protection of human health and the environment.	IDW will be managed in a manner to protect human health and the environment.
State	Remediation of metallic mining sites	Maine Metallic Mineral Exploration, Advanced Explorations, and Mining (06-096 C.M.R. Chapter 200)	Relevant and Appropriate	These rules define mine waste and contain requirements for reclamation, closure, and post-closure activities at metallic mineral mines. Except for land clearing debris and wood waste, Subchapter 5 (*Mine Waste Treatment and Management*) applies to mine waste in lieu of Solid Waste Management Rules at 06-096 CMR Chapter 400-409.	The selected remedy will meet the substantive portions of these regulations for reclamation, closure, and post-closure activities by capping waste in the Tailing Impoundment area, using a treatment wetland for runoff, and disposing of all other contaminated soil/sediment in OU1 in the CAD cell. The Dyer and Goose Cove wetland restorations will also remove mine waste from Site waterbodies and dispose of the waste in the CAD cell.
State	Cleanup and disposal of hazardous waste	Maine Hazardous Waste Rules for Identification and Listing of Hazardous Wastes (38 M.R.S.A. § 1301 *et seq.*; 06-096 C.M.R. 850)	Applicable	These standards establish requirements for determining whether wastes are hazardous based on either characteristics or listing.	Wastes generated as part of remedial activities that will be disposed of off-site (PCB and petroleum contaminated material, treatment wetland waste) will be characterized as hazardous or non-hazardous.
State	Cleanup and disposal of hazardous waste	Maine Hazardous Waste Management Rules - Requirements for Generators (38 M.R.S.A. § 1301 *et seq.*; 06-096 C.M.R. 851)	Applicable	These regulations contain requirements for generators of hazardous waste.	Wastes generated as part of remedial activities that will be disposed of off-site (PCB and petroleum contaminated material, treatment wetland waste), if characterized as hazardous, will be managed of in accordance with these standards.
State	Management of land clearing debris and wood waste	Maine Solid Waste Management Rules (06-096 C.M.R. Chapter 400-409)	Applicable	These rules apply to land clearing debris and wood wastes at mining sites, in lieu of 06-096 CMR Chapter 200.	To the extent that land clearing debris and wood wastes are generated and landfilled as part of site remediation, they will be handled and disposed in accordance with these regulations.

Table 61
Action-Specific ARARs and TBCs for OU1 Remedial Action (Alternative CMS2)
Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, WRP-3), Residential Use Area Soil; and Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

Regulatory Authority	Action	Requirement	Status	Requirement Synopsis	Actions to be Taken to Attain Requirement
State	Surface water discharge	Maine Waste Discharge Licenses (38 M.R.S.A. § 413 *et seq.*) and Waste Discharge Permitting Program (06-096 C.M.R. Chapter 520-529)	Applicable	These standards regulate the discharge of pollutants from point sources.	All substantive requirements of these standards will be met with respect to any point source discharge to surface water, particularly from the treatment wetland. Appropriate controls and best management practices will be implemented.
State	Actions that may degrade surface water quality	Maine Water Classification Program (38 M.R.S.A., Section 464-470)	Applicable	This program sets forth standards for the classification of Maine's water. Activities in a water body cannot lower water quality below the designated classification. Marsh Creek, Goose Pond, and Goose Cove are Class SB. Designated uses for Class SB waters include recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish, industrial process and cooling water supply, hydroelectric power generation, navigation and as habitat for fish and other estuarine and marine life.	Site activities will be designed and implemented in a manner that does not degrade the chemical, physical, or biological integrity of Marsh Creek, Goose Pond, or Goose Cove. Water quality will be monitored during dredging/excavation operations and during disposal into the CAD cell. Long-term water quality monitoring of the Tailing Impoundment cap, treatment wetland, and CAD cell will also be conducted.
State	Actions that may degrade surface water quality	Maine Surface Water Toxics Program (38 M.R.S.A. §. 420; 06-096 C.M.R. Chapter 530)	Applicable	These rules set forth the State water quality criteria for toxic water pollutants and procedures necessary to control levels of toxic pollutants in surface waters.	Site activities will be designed and implemented in a manner that does not degrade the chemical, physical, or biological integrity of Marsh Creek, Goose Pond, or Goose Cove. Water quality will be monitored during dredging/excavation operations and during disposal into the CAD cell. Long-term water quality monitoring of the Tailing Impoundment cap, treatment wetland, and CAD cell will also be conducted.

Table 61
Action-Specific ARARs and TBCs for OU1 Remedial Action (Alternative CMS2)
Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, WRP-3), Residential Use Area Soil; and Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

Regulatory Authority	Action	Requirement	Status	Requirement Synopsis	Actions to be Taken to Attain Requirement
State	Actions that may degrade surface water quality	Maine Surface Water Quality Criteria for Toxic Pollutants (06-096 C.M.R. Chapter 584)	Applicable	Except if they naturally occur, levels of toxic pollutants in surface waters must not exceed State water quality criteria.	Site activities will be designed and implemented in a manner that does not degrade the chemical, physical, or biological integrity of Marsh Creek, Goose Pond, or Goose Cove. Water quality will be monitored during dredging/excavation operations and during disposal into the CAD cell. Long-term water quality monitoring of the Tailing Impoundment cap, treatment wetland, and CAD cell will also be conducted.
State	Quarrying of rock	Performance Standards For Quarries (38 M.R.S.A. §§ 490-W – 490-EE)	Applicable	This law provides standards that apply to any quarry that is more than one acre in size, including reclaimed and unreclaimed areas, or at which underground production blasting is proposed.	If on-site rock is quarried to provide material for constructing the Tailings Impoundment cover, these standards will be complied with (including reclamation of the area once the remedy no longer needs a source of quarried rock).
State	Activities that expose soil with potential for erosion	Maine Erosion and Sedimentation Control (38 M.R.S.A. § 420-C)	Applicable	Activities that involve filling, displacing, or exposing soil or other earthen materials must take measures to prevent unreasonable erosion of soil or sediment beyond the project site or into a protected natural resource. Erosion control measures must be in place before the activity begins. Measures must remain in place and functional until the site is permanently stabilized.	Appropriate controls will be implemented to address erosion, sedimentation, and storm water.

Table 61
Action-Specific ARARs and TBCs for OU1 Remedial Action (Alternative CMS2)
Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, WRP-3), Residential Use Area Soil; and Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

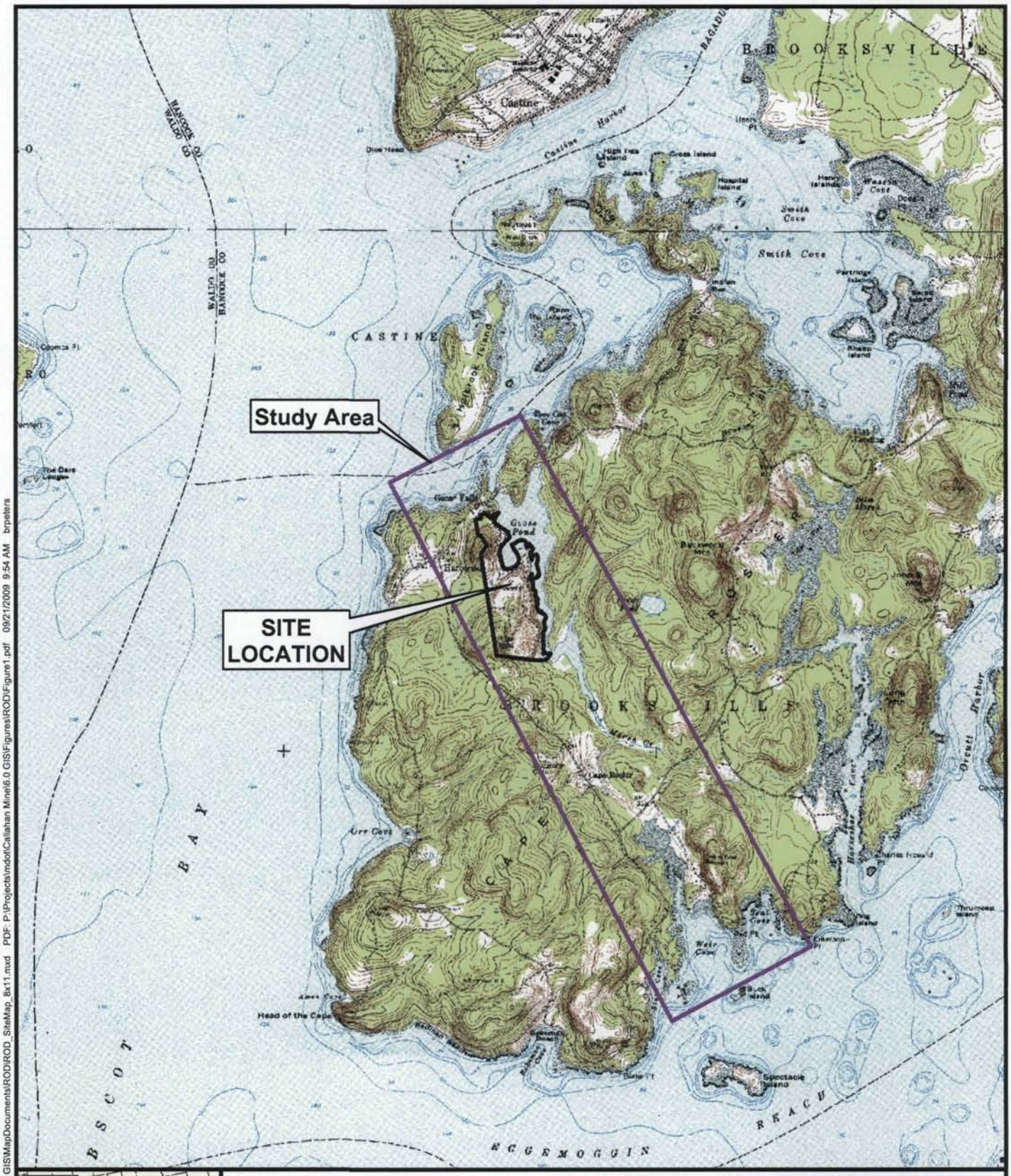
Regulatory Authority	Action	Requirement	Status	Requirement Synopsis	Actions to be Taken to Attain Requirement
State	Activities that expose soil with potential for erosion	Maine Storm Water Management (38 M.R.S.A. § 420-D), Maine Storm Water Management Rules (06 096 C.M.R. Chapter 500), and Direct Watershed of Waterbodies Most at Risk from New Development and Sensitive or Threatened Regions or Watersheds (06-096 C.M.R. Chapter 502)	Applicable	Storm water quality standards for projects with 3 acres or less of impervious surface may address phosphorus, nitrates, and suspended solids, but may not directly address other dissolved or hazardous materials unless infiltration is proposed. The Storm Water Management Rules establish standards to prevent and control the release of pollutants to water bodies, wetlands, and groundwater, and reduce impacts associated with increases and changes in flow.	Where activities described in 38 M.R.S.A. 420-D occur at the Site, appropriate controls to address erosion, sedimentation, and storm water will be implemented. Erosion control measures will be in place prior to the construction of the Tailing Impoundment cap, treatment wetland, and excavation of all upland OU1 contaminated material to be disposed of into the CAD cell
State	Generation of air emissions	Maine Air Quality Control Laws; Protection and Improvements of Air (38 M.S.R.A. §§ 581-608-A), Chapters 101, 105, 110, 115)	Applicable	This law and its associated regulations detail the requirements, limitations, and exemptions of State air emissions, including fugitive dust. The standard for particulate matter is 150 µg/m3 (micrograms per cubic meter), 24 hour average concentration.	Dust suppression will be utilized as needed to comply with this standard.

Table 61
Action-Specific ARARs and TBCs for OU1 Remedial Action (Alternative CMS2)
Capping of Tailings Impoundment; Off-Site Disposal of PCB and Petroleum Contaminated Soil; Subaqueous Disposal of Source Area Material (from the Ore Pad, Mine Operations Area, WRP-3), Residential Use Area Soil; and Sediment in a Confined Aquatic Disposal (CAD) Cell in the Former Mine Pit

Regulatory Authority	Action	Requirement	Status	Requirement Synopsis	Actions to be Taken to Attain Requirement
State Criteria, Advisories and Guidance	Generation of air emissions	Maine Department of Human Services Interim Ambient Air Guidelines, Memorandum February 23, 1993.	To Be Considered	Interim ambient air guidelines are derived from risk assessment-based criteria or from occupational exposure criteria that are protective of ambient air quality.	These guidelines will be considered during the design of emissions controls.

Notes:

ARAR = Applicable or Relevant and Appropriate Requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act, as amended
C.F.R. = Code of Federal Regulations
C.M.R. = Code of Maine Regulations
IDW = Investigation-Derived Waste
ME DEP = Maine Department of Environmental Protection
M.R.S.A. = Maine Revised Statutes Annotated
µg/m3 = micrograms per cubic meter
NPDES = National Pollutant Discharge Elimination System
OSWER = Office of Solid Waste and Emergency Response
U.S.C. = United States Code
USEPA = U.S. Environmental Protection Agency



1:24,000 scale digital topographic map obtained from Maine Office of GIS at http://apollo.ogis.state.me.us/catalog

N

0 2,000 4,000 Feet

Prepared/Date: BRP 09/21/09 | Checked/Date: SWR 09/21/09

Callahan Mine OU1 ROD - Figure 1
Site and Study Areas

Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.

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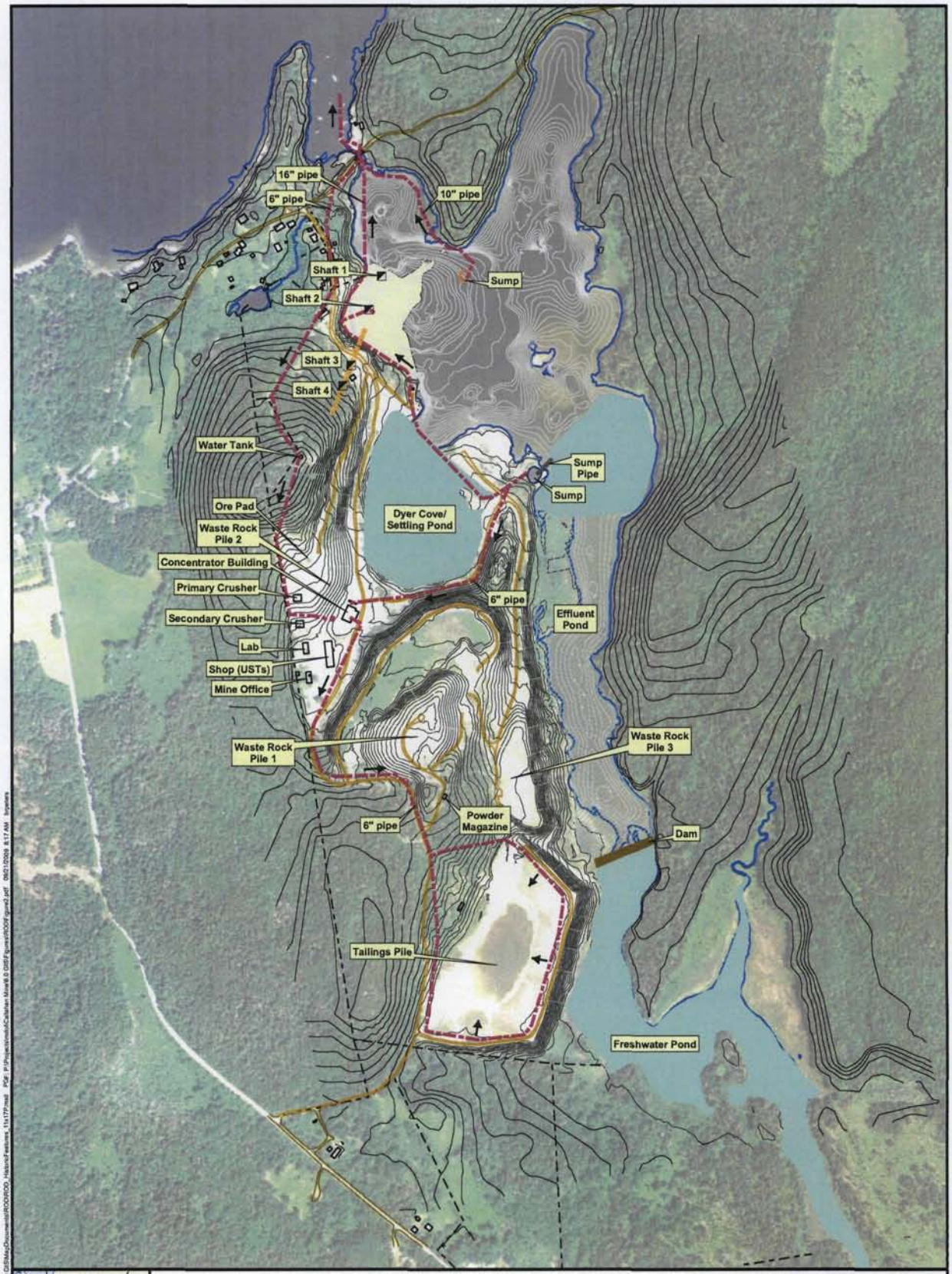


Legend

- *Mine Shaft*
- Purported Lateral Mine Shafts
  The "920" and the "860"
- Operations Piping
- *Water*
- Intermittent Water
- Pre-Mine Shoreline Excavated

N

0 250 500 Feet

Prepared/Date: BRP 09/21/09 | Checked/Date: SWR 09/21/09

Callahan Mine OU1 ROD - Figure 2
Historical Mine Features (1972)

Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.

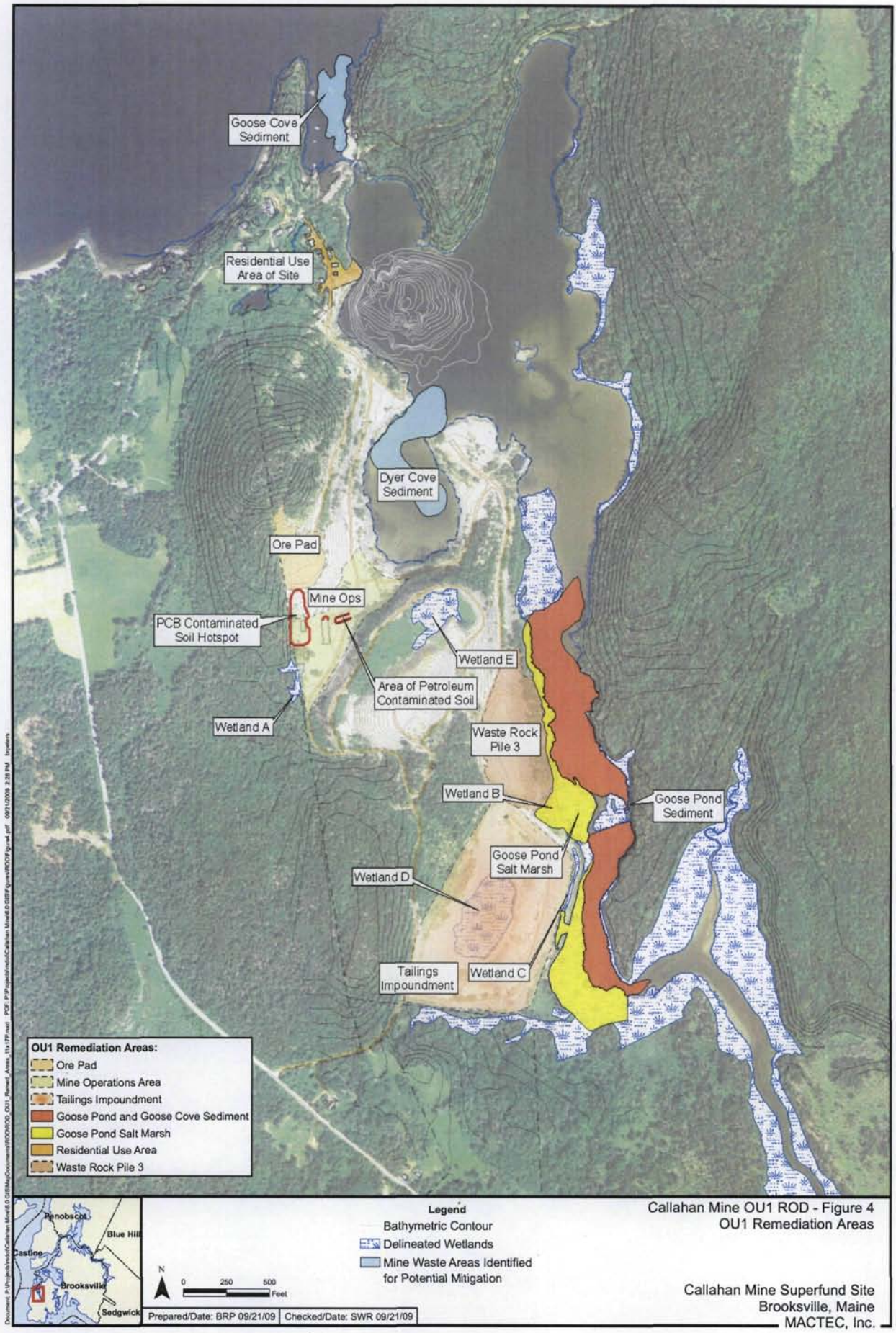
Callahan Mine OU1 ROD - Figure 3
Site Photo (looking south), 1972

Callahan Mine Superfund Site
Brooksville, Maine

Prepared by JPH | Checked By SWR

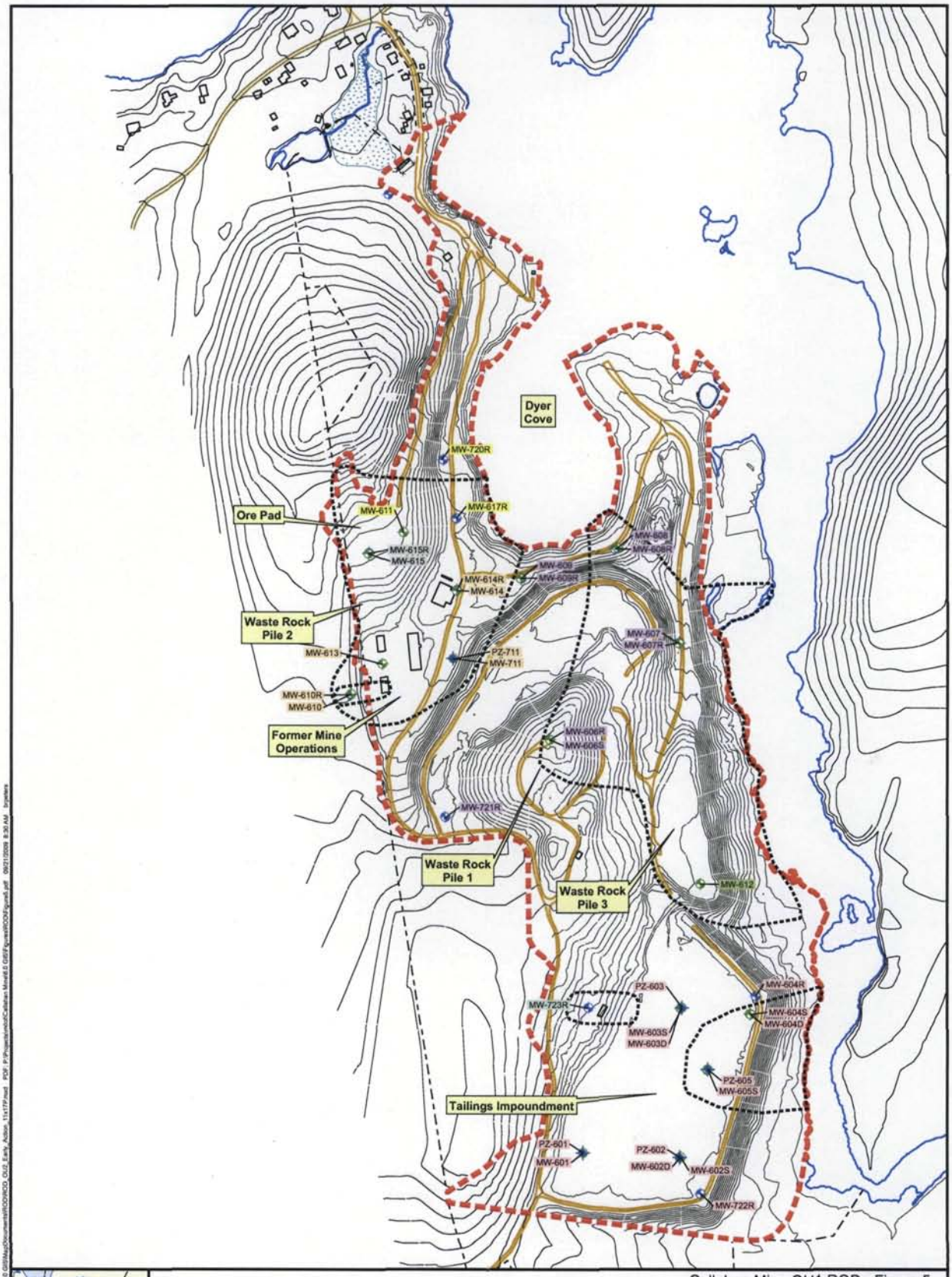
MACTEC, Inc.

PORT2009028b.cdr



Callahan Mine OU1 ROD - Figure 4
OU1 Remediation Areas

Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.



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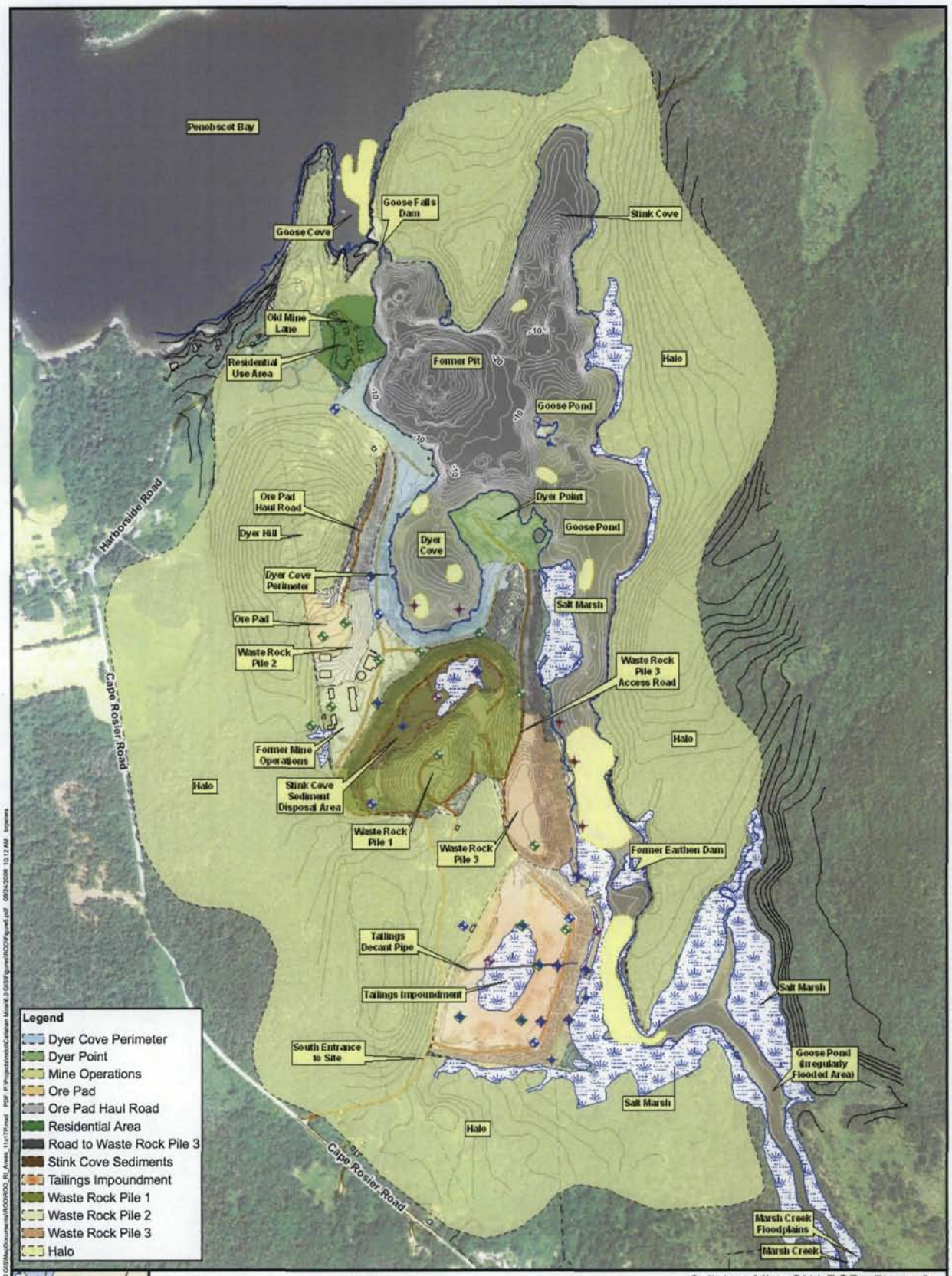
Callahan Mine OU1 ROD - Figure 5
OU2 Early Action IC Areas

Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.



Legend

- Pore Water Sample
- Piezometer
- Overburden Monitoring Well
- Overburden Hydraulic Control Monitoring Well
- Bedrock Monitoring Well
- Decant Pipe
- Bathymetric Contour
- Mine Waste in Sediment
- Delineated Wetlands

N

0 275 550 Feet

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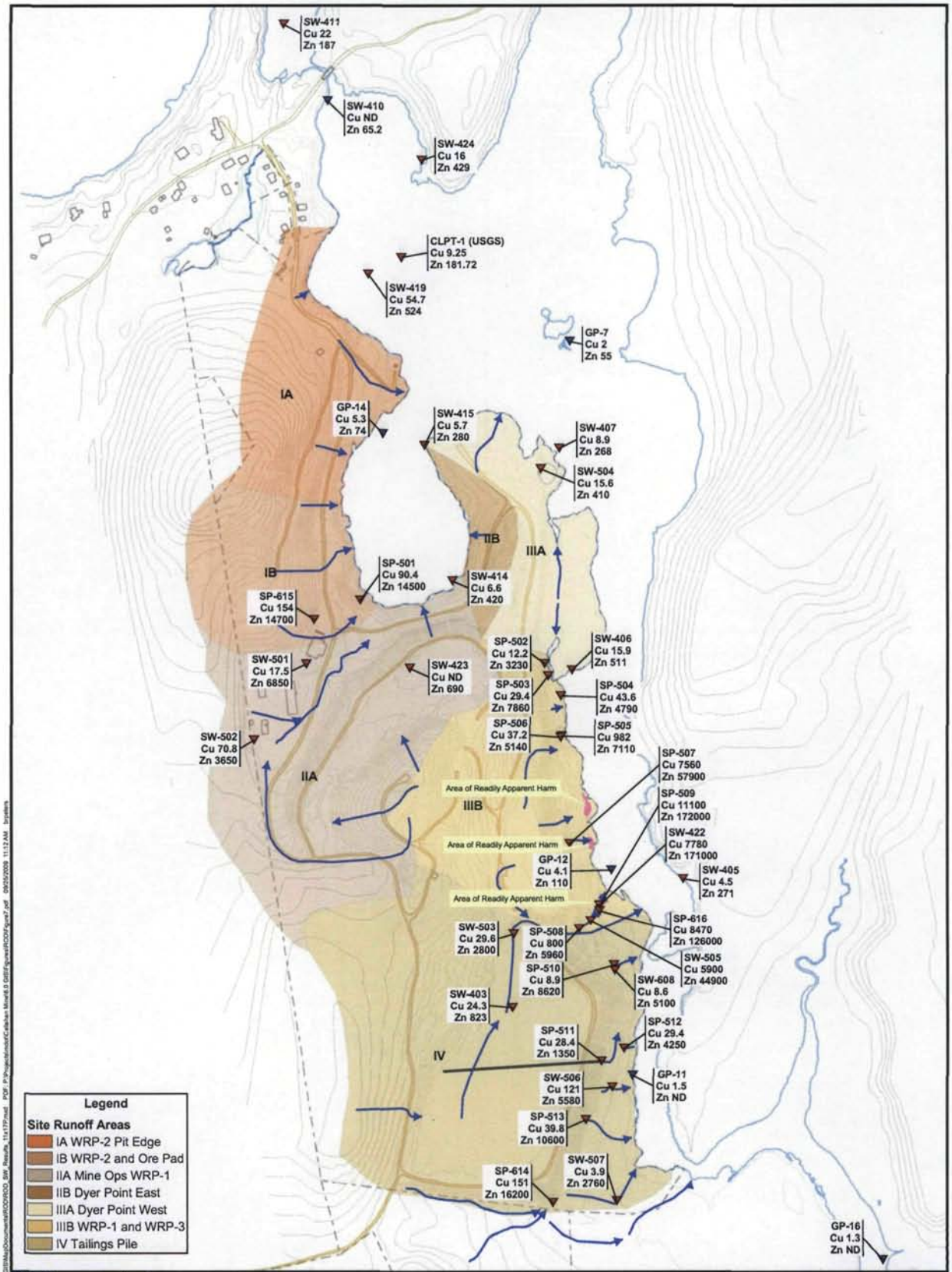
Callahan Mine OU1 ROD - Figure 6
RI Investigation Areas

Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.



Legend

- Copper or Zinc >= AWQC
- Copper and Zinc < AWQC
- Area of Readily Apparent Harm

Note: Maximum Dissolved Fraction Results

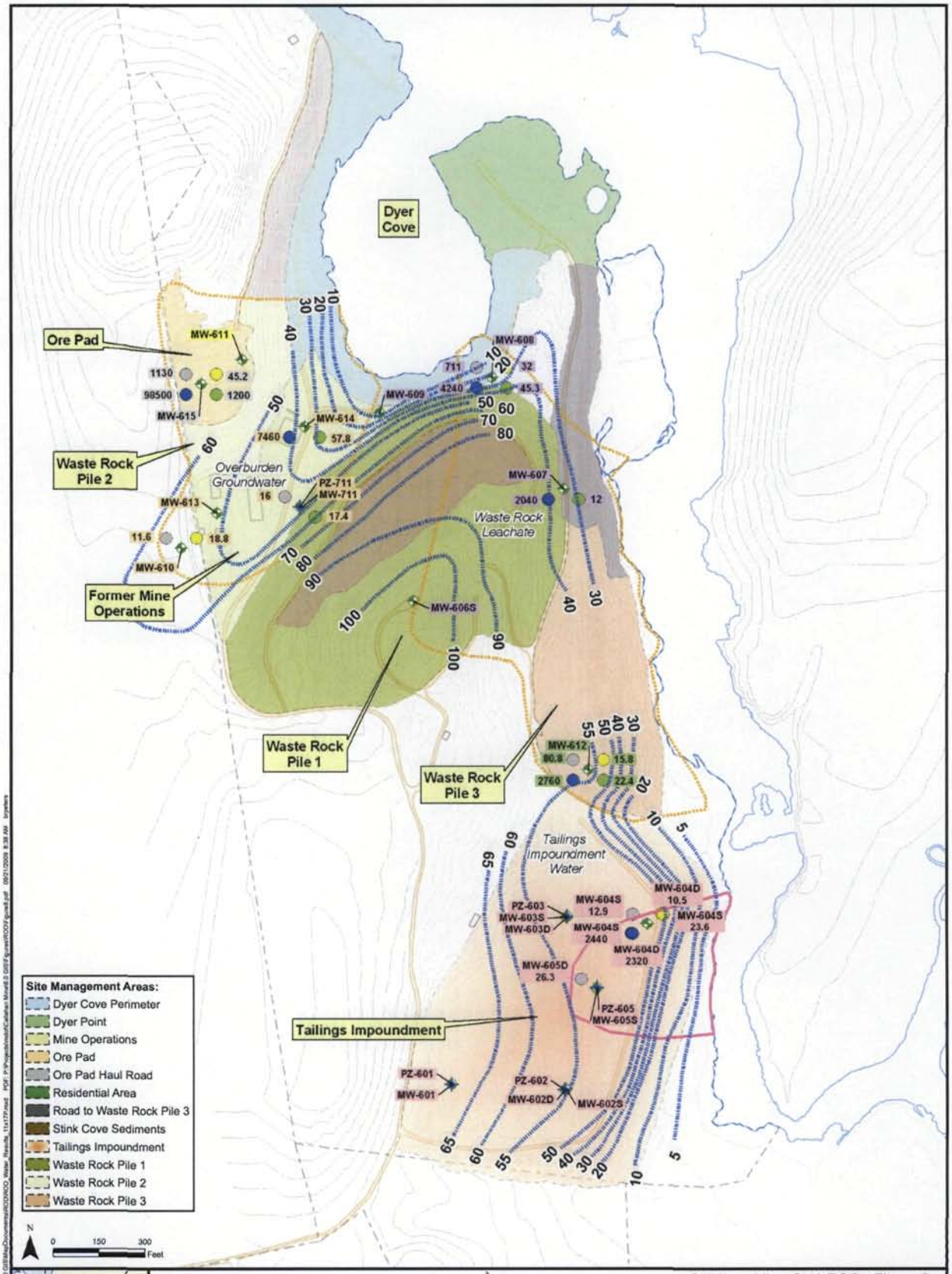
N

0 200 400 Feet

Prepared/Date: BRP 09/25/09 | Checked/Date: SWR 09/25/09

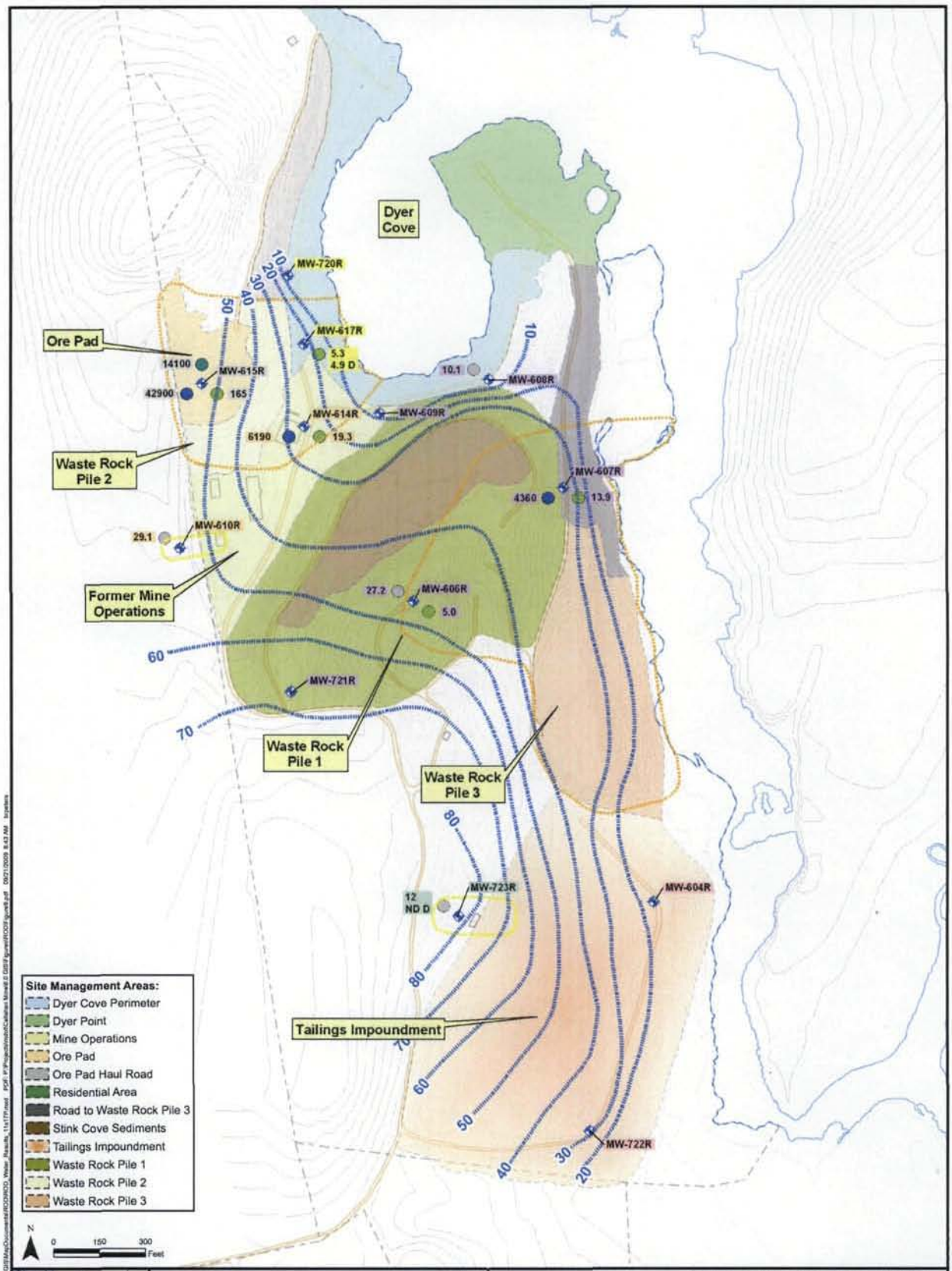
Callahan Mine OU1 ROD - Figure 7
Surface Water Runoff Pathways and Seeps

Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.



Callahan Mine OU1 ROD - Figure 8
Overburden Groundwater Exceeding
As, Cd, Cu, Pb, and Zn MCLs/MEGs

Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.



Legend

- Bedrock Groundwater Contour (8/27/07)
- Bedrock Groundwater in Excess of MCLs/MEGs:
  - Background Mine Ops/Tailings Impoundment
  - Ore Pad/Mine Ops
  - Waste Rock Pile 1 & 3
- Bedrock Monitoring Well
- Arsenic >MCL/MEG 10 ug/L
- Cadmium > MEG 3.5 ug/L (MCL 5.0 ug/L)
- Copper > MCL/MEG 1,300 ug/L
- Lead > MEG 10 ug/L (MCL 15 ug/L)
- Zinc > MEG 2,000 ug/L (MCL 5,000 ug/L)

D - Duplicate Sample ND - Non-Detect

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Callahan Mine OU1 ROD - Figure 9
Bedrock Groundwater Exceeding
As, Cd, Cu, Pb, and Zn MCLs/MEGs

Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.

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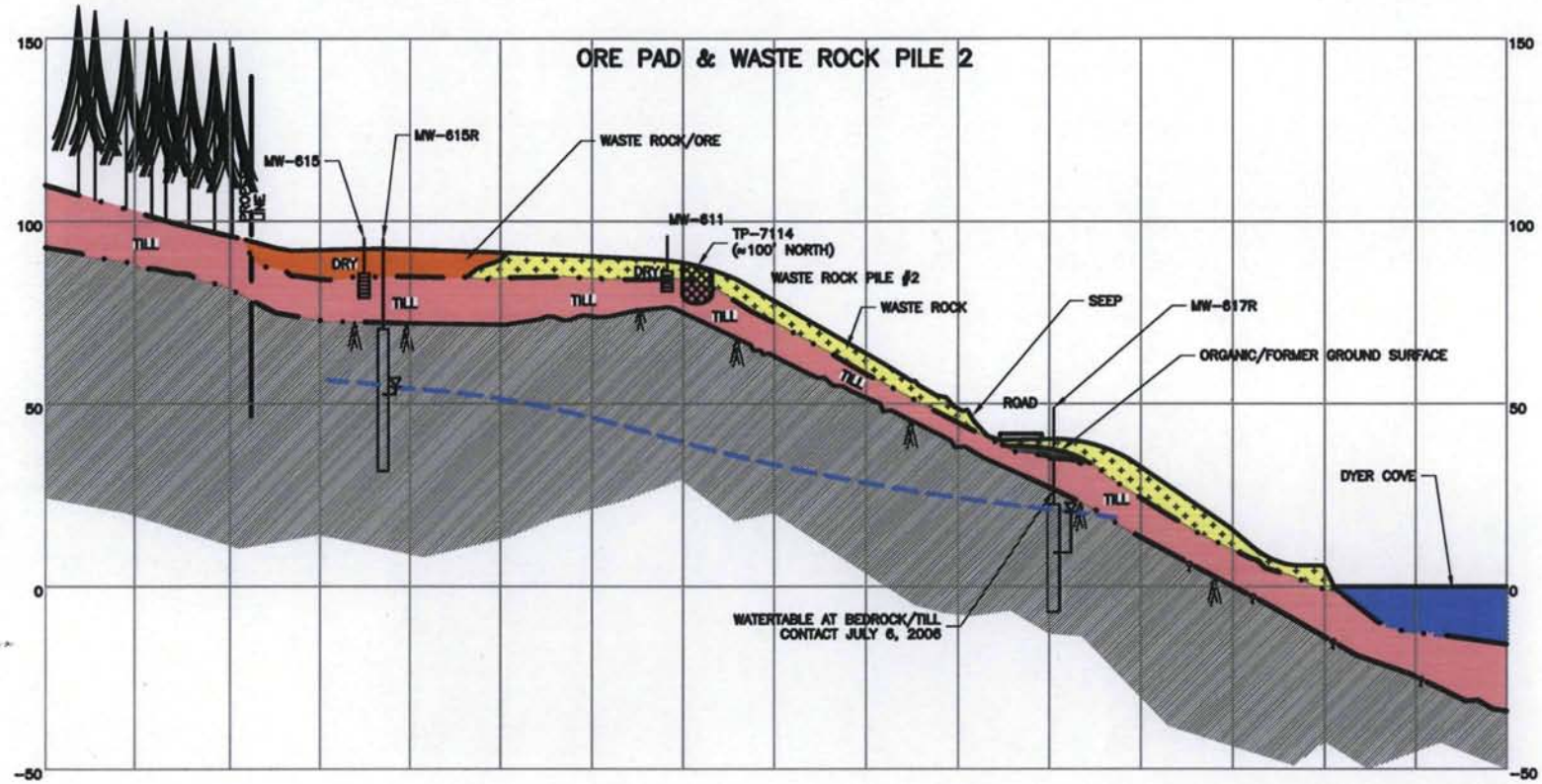

LEGEND

- ORGANIC/OLD GROUND SURFACE
- WASTE ROCK
- WASTE ROCK/ORE
- TILL
- BEDROCK

SCREENED MONITORING WELL

WATER LEVEL IN MONITORING WELL
OPEN HOLE BEDROCK WELL

WATER ELEVATION DATA FROM
08/27/07

SURFACE WATER LEVEL

0 50 100 200
HORIZONTAL SCALE IN FEET

0 25 50 100
VERTICAL SCALE IN FEET

Prepared/Date: RJR 09/18/09
Checked/Date: SR 09/18/09

CALLAHAN MINE SUPERFUND SITE
BROOKSVILLE, MAINE
Project 3612-06-2047.32

MACTEC

CALLAHAN MINE OU1 ROD - FIGURE 10
CROSS SECTION THROUGH
ORE PAD AND WRP 2

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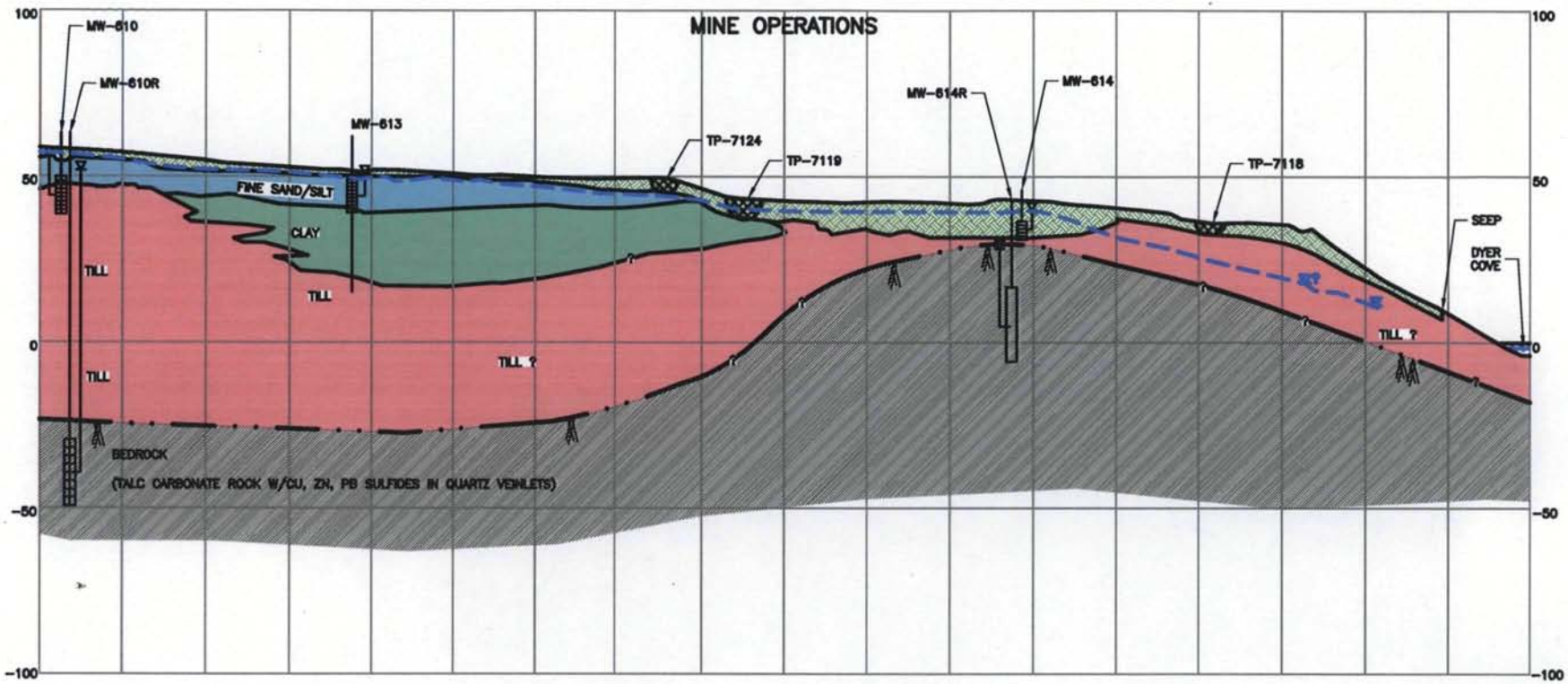

LEGEND

- CLAY
- FINE SAND/SILT
- TILL
- BEDROCK
- FILL

SCREENED MONITORING WELL

WATER LEVEL IN MONITORING WELL
OPEN HOLE BEDROCK WELL

WATER ELEVATION DATA FROM 08/27/07

SURFACE WATER LEVEL

0 50 100 200
HORIZONTAL SCALE IN FEET

0 25 50 100
VERTICAL SCALE IN FEET

Prepared/Date: RJR 09/18/09
Checked/Date: SR 09/18/09

CALLAHAN MINE SUPERFUND SITE
BROOKSVILLE, MAINE
Project 3612-06-2047.32

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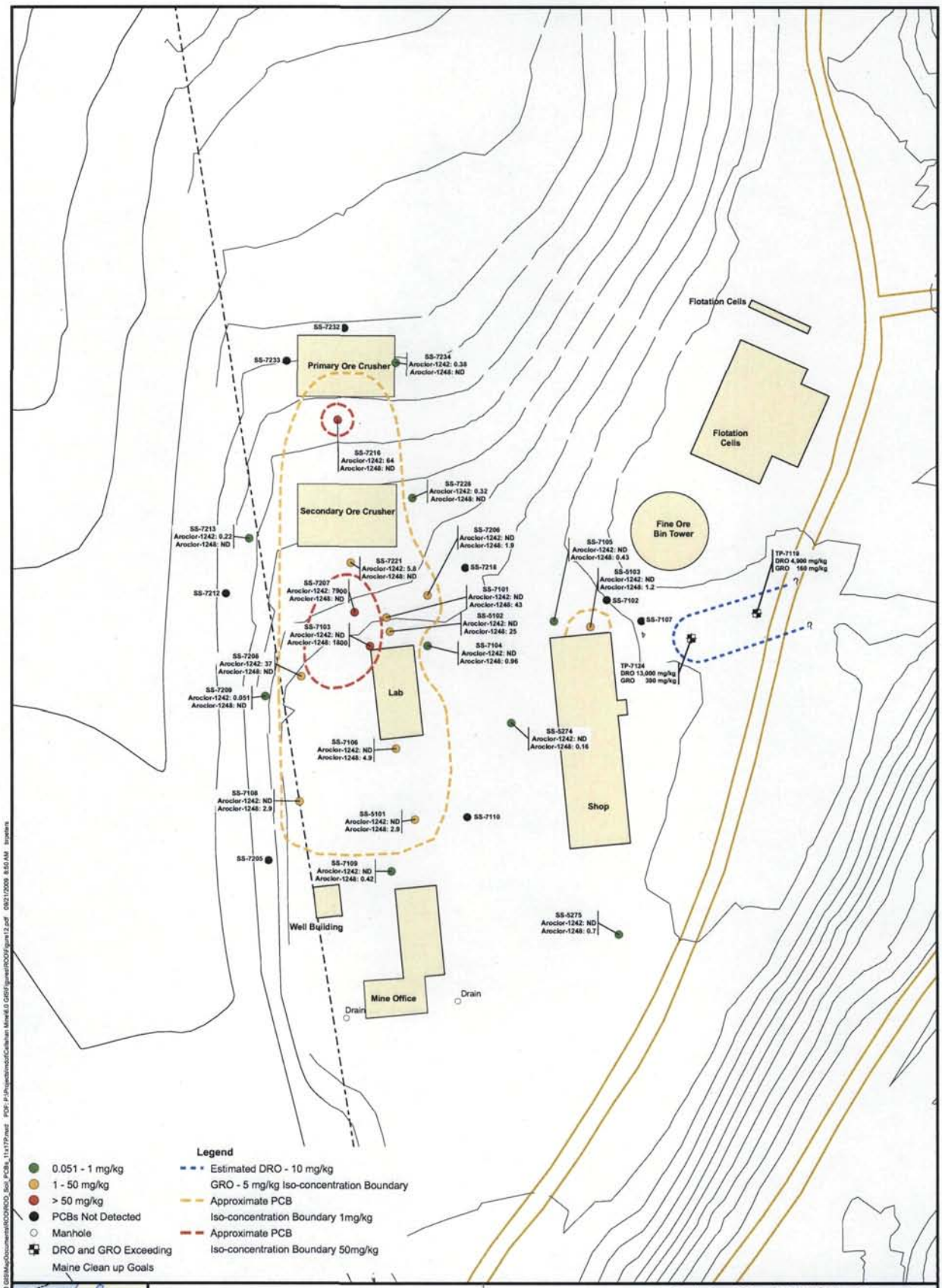
CALLAHAN MINE OU1 ROD - FIGURE 11
CROSS SECTION THROUGH
MINE OPERATIONS AREA



Callahan Mine OU1 ROD - Figure 12
Areas Exceeding PCB PRGs and DRO/GRO Cleanup Goals

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Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.

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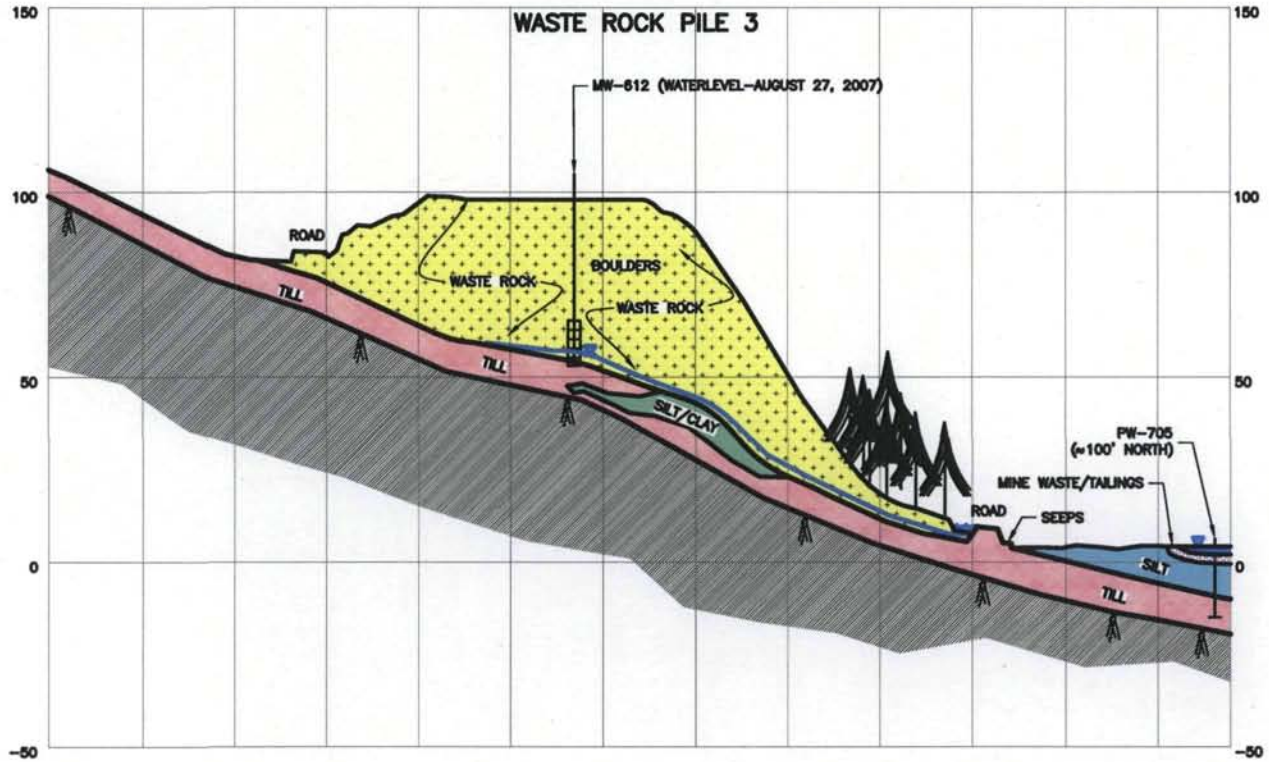

LEGEND

- WASTE ROCK
- CLAY
- FINE SAND/SILT
- TILL
- BEDROCK

SCREENED MONITORING WELL

WATER LEVEL IN MONITORING WELL
OPEN HOLE BEDROCK WELL

SURFACE WATER LEVEL

0 50 100 200
HORIZONTAL SCALE IN FEET

0 25 50 100
VERTICAL SCALE IN FEET

Prepared/Date: RJR 09/18/09
Checked/Date: SR 09/18/09

CALLAHAN MINE SUPERFUND SITE
BROOKSVILLE, MAINE
Project 3612-06-2047.32

MACTEC

CALLAHAN MINE OU1 ROD - FIGURE 13
CROSS SECTION THROUGH WRP 3

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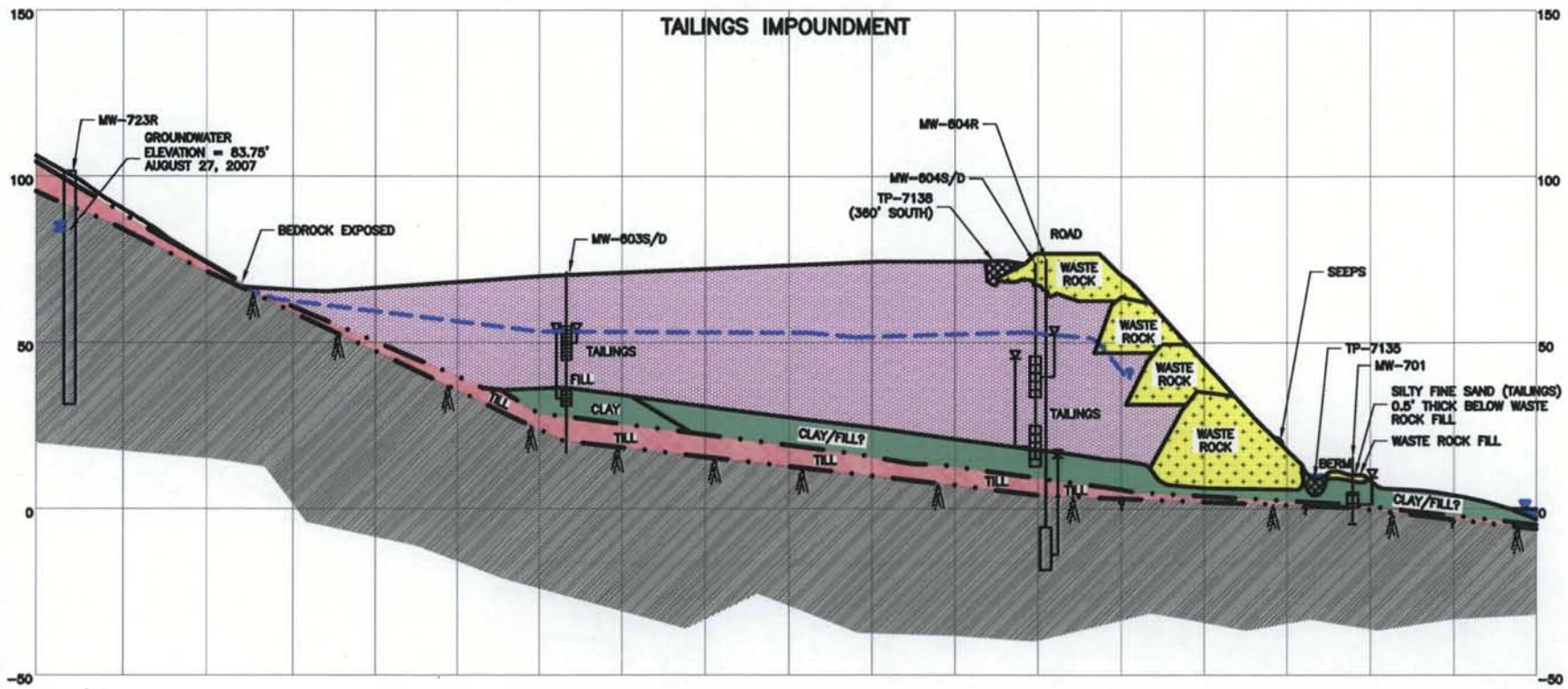


LEGEND

- TAILINGS
- WASTE ROCK
- CLAY
- TILL
- BEDROCK

SCREENED MONITORING WELL

WATER LEVEL IN MONITORING WELL
OPEN HOLE BEDROCK WELL

WATER ELEVATION DATA FROM 08/27/07

SURFACE WATER LEVEL

0 50 100 200
HORIZONTAL SCALE IN FEET

0 25 50 100
VERTICAL SCALE IN FEET

Prepared/Date: RJR 09/18/09
Checked/Date: SR 09/18/09

CALLAHAN MINE SUPERFUND SITE
BROOKSVILLE, MAINE
Project 3612-06-2047.32

MACTEC

CALLAHAN MINE OU1 ROD - FIGURE 14
CROSS SECTION THROUGH
TAILINGS IMPOUNDMENT

Callahan Mine OU1 ROD - Figure 15
Residential Use Area Remediation

Legend

- Arsenic <= 14, Lead <= 375, and Thallium <= 15 mg/kg
- Arsenic > 14, Lead > 375, and Thallium > 15 mg/kg
- Bedrock Outcrops
- Risk Assessment Data Groups
- Area to be excavated - 41060 Sq. Feet

Prepared/Date: BRP 09/21/09 | Checked/Date: SWR 09/21/09

0 30 60 Feet

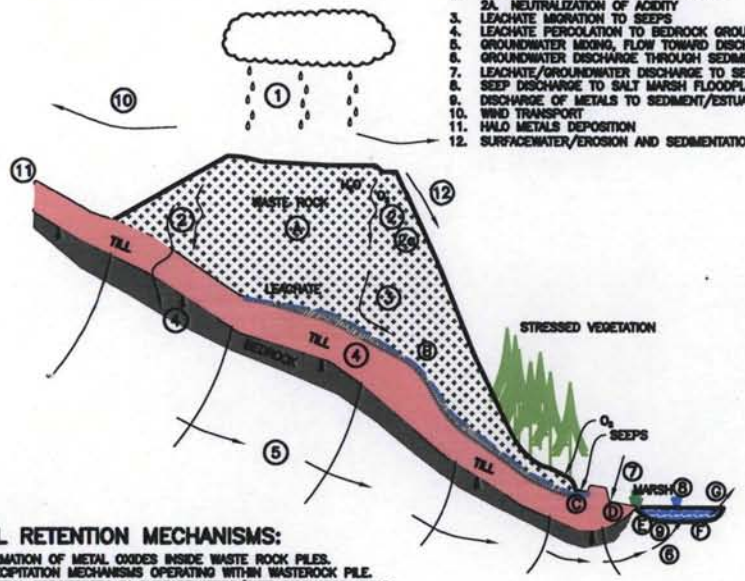
N

Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.

WASTE ROCK PILES AND ORE PAD

TRANSPORT PROCESSES:

1. PRECIPITATION
2. SULFIDE OXIDATION, GENERATION OF ARD
   2A. NEUTRALIZATION OF ACIDITY
3. LEACHATE MIGRATION TO SEEPS
4. LEACHATE PERCOLATION TO BEDROCK GROUNDWATER
5. GROUNDWATER MIXING, FLOW TOWARD DISCHARGE
6. GROUNDWATER DISCHARGE THROUGH SEDIMENT TO SURFACE WATER
7. LEACHATE/GROUNDWATER DISCHARGE TO SEEPS AND SURFACE WATER
8. SEEP DISCHARGE TO SALT MARSH FLOODPLAIN SOILS
9. DISCHARGE OF METALS TO SEDIMENT/ESTUARY COLUMN
10. WIND TRANSPORT
11. HALO METALS DEPOSITION
12. SURFACEWATER/EROSION AND SEDIMENTATION



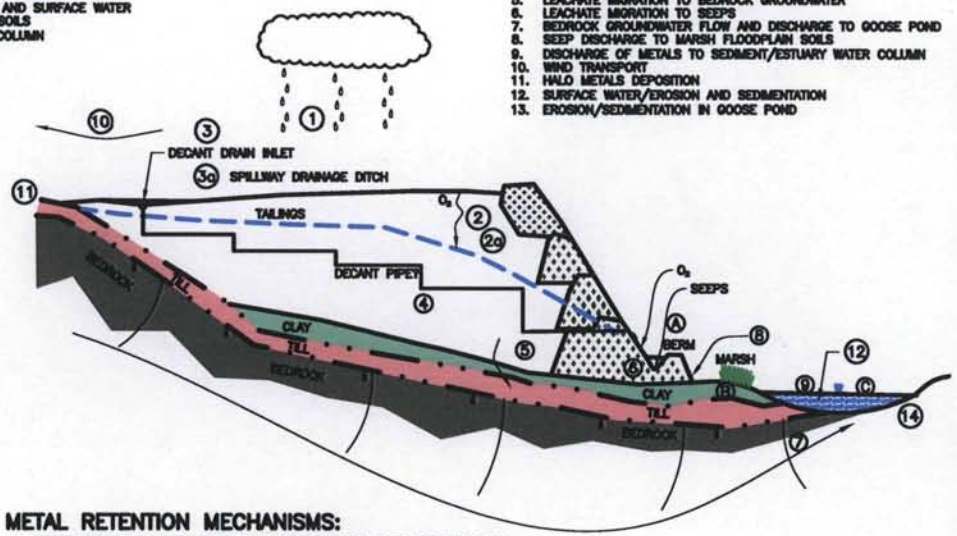
METAL RETENTION MECHANISMS:

A. FORMATION OF METAL OXIDES INSIDE WASTE ROCK PILES.
B. PRECIPITATION MECHANISMS OPERATING WITHIN WASTEROCK PILE.
C. MINERAL PRECIPITATES IN SURFACEWATERS/SEEP DISCHARGE AREAS.
D. SORPTION/RETENTION OF METALS IN SALT MARSH SEDIMENTS.
E. METALS IN GROUNDWATER; DISCHARGED TO AND RETAINED BY SEDIMENTS.
F. METALS RETAINED IN "MINE WASTE" LAYER IN SEDIMENT.
G. AREAS OF EROSION AND SEDIMENTATION IN GOOSE POND.

TAILINGS IMPOUNDMENT

TRANSPORT PROCESSES:

1. PRECIPITATION
2. SULFIDE OXIDATION, GENERATION OF ARD ABOVE WATERTABLE
   2A. NEUTRALIZATION OF ACIDITY
3. SURFACE WATER RUN-OFF TO VERTICAL CAST IRON DRAIN PIPE
   3A. SURFACE WATER RUN-OFF TO DRAINAGE DITCH
4. NO PYRITE OXIDATION IN SATURATED TAILINGS
5. LEACHATE MIGRATION TO BEDROCK GROUNDWATER
6. LEACHATE MIGRATION TO SEEPS
7. BEDROCK GROUNDWATER FLOW AND DISCHARGE TO GOOSE POND
8. SEEP DISCHARGE TO MARSH FLOODPLAIN SOILS
9. DISCHARGE OF METALS TO SEDIMENT/ESTUARY WATER COLUMN
10. WIND TRANSPORT
11. HALO METALS DEPOSITION
12. SURFACE WATER/EROSION AND SEDIMENTATION
13. EROSION/SEDIMENTATION IN GOOSE POND



METAL RETENTION MECHANISMS:

A. SEDIMENTATION IN DITCH BETWEEN TAILINGS IMPOUNDMENT AND SMALL BERM.
B. SORPTION AND EXTENT OF METALS IN MARSH FLOOD PLAIN SOILS.
C. METALS RETAINED IN "MINE WASTE" LAYER IN SEDIMENT.

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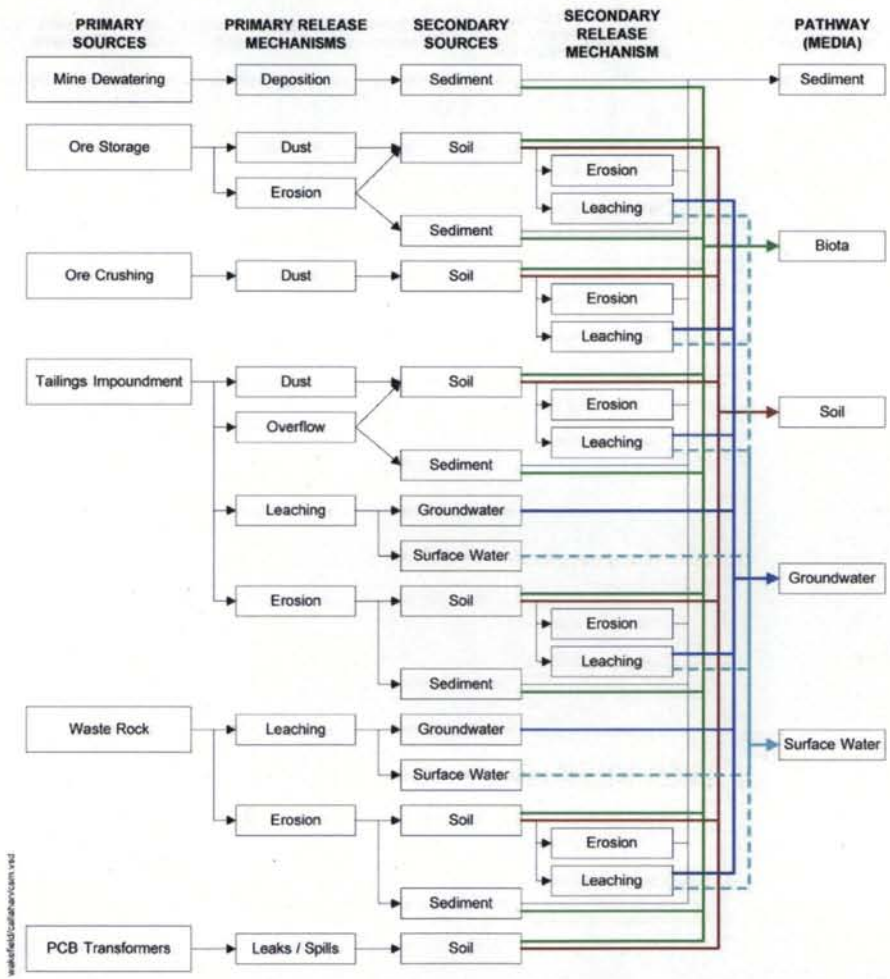
CALLAHAN MINE SUPERFUND SITE
BROOKSVILLE, MAINE
Project 3612-06-2047.32

MACTEC

CALLAHAN MINE OU1 ROD - FIGURE 16
CONCEPTUAL SITE MODEL



RECEPTOR

EXPOSURE ROUTE	HUMAN: Site Resident	HUMAN: Recreational User	BIOTA: Terrestrial	BIOTA: Aquatic
Sediment				
Ingestion	•	•		•
Inhalation				
Dermal Contact	•	•		
Biota				
Ingestion	•	•		•
Inhalation				
Dermal Contact				
Soil				
Ingestion	•	•	•	
Inhalation	•	•		
Dermal Contact	•	•		
Groundwater				
Ingestion	•	•		
Inhalation	•	•		
Dermal Contact	•	•		
Surface Water				
Ingestion	•	•	•	•
Inhalation				
Dermal Contact	•	•		

Callahan Mine OU1 ROD - Figure 17
Conceptual Site Model Exposure Pathways

Callahan Mine Superfund Site
Brooksville, Maine

MACTEC, Inc.

Prepared by KJC 09/09/09 | Checked By JHP/AMR 09/09/09

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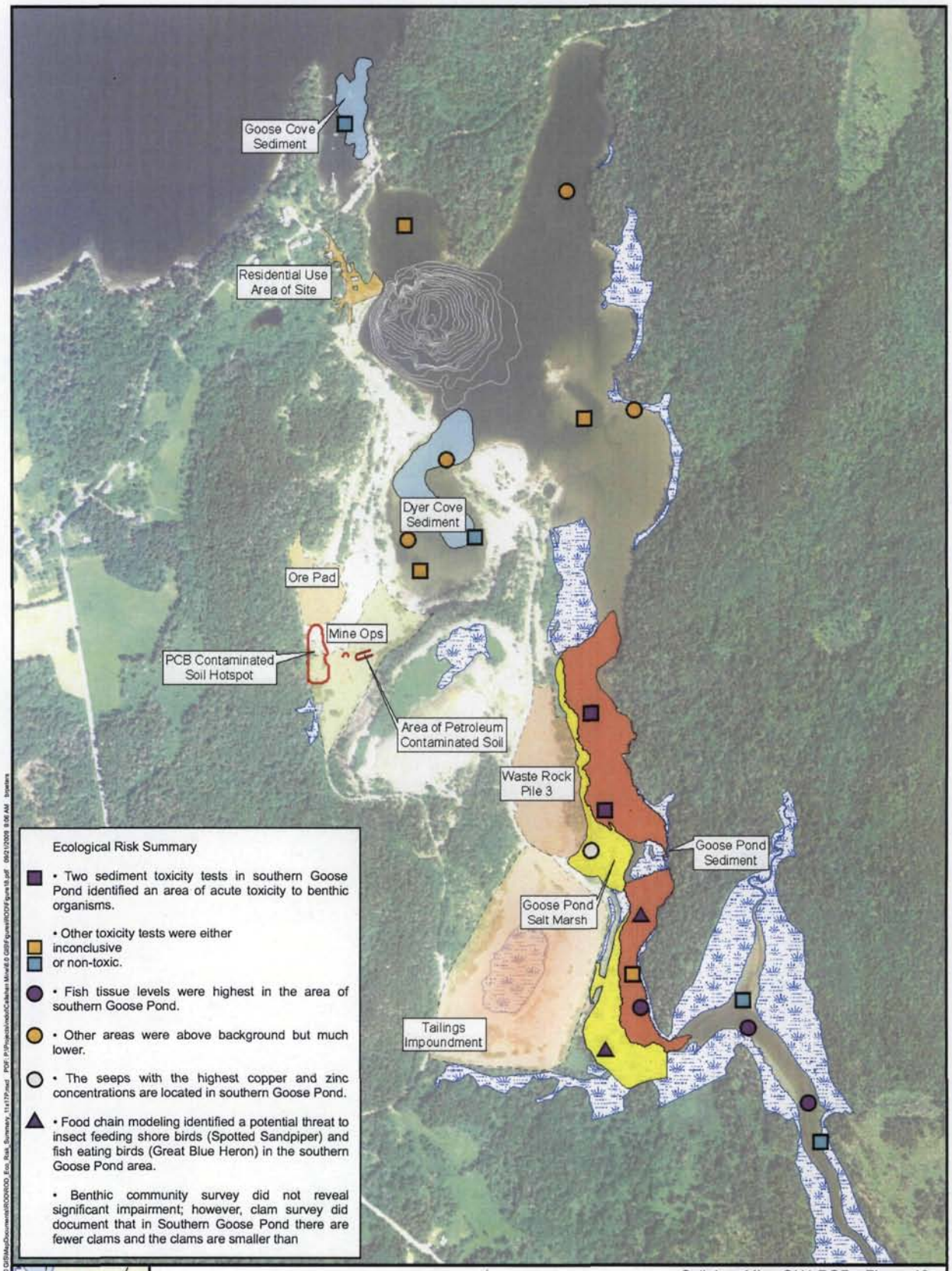

Legend

Bathymetric Contour

Delineated Wetlands

N

0 250 500 Feet

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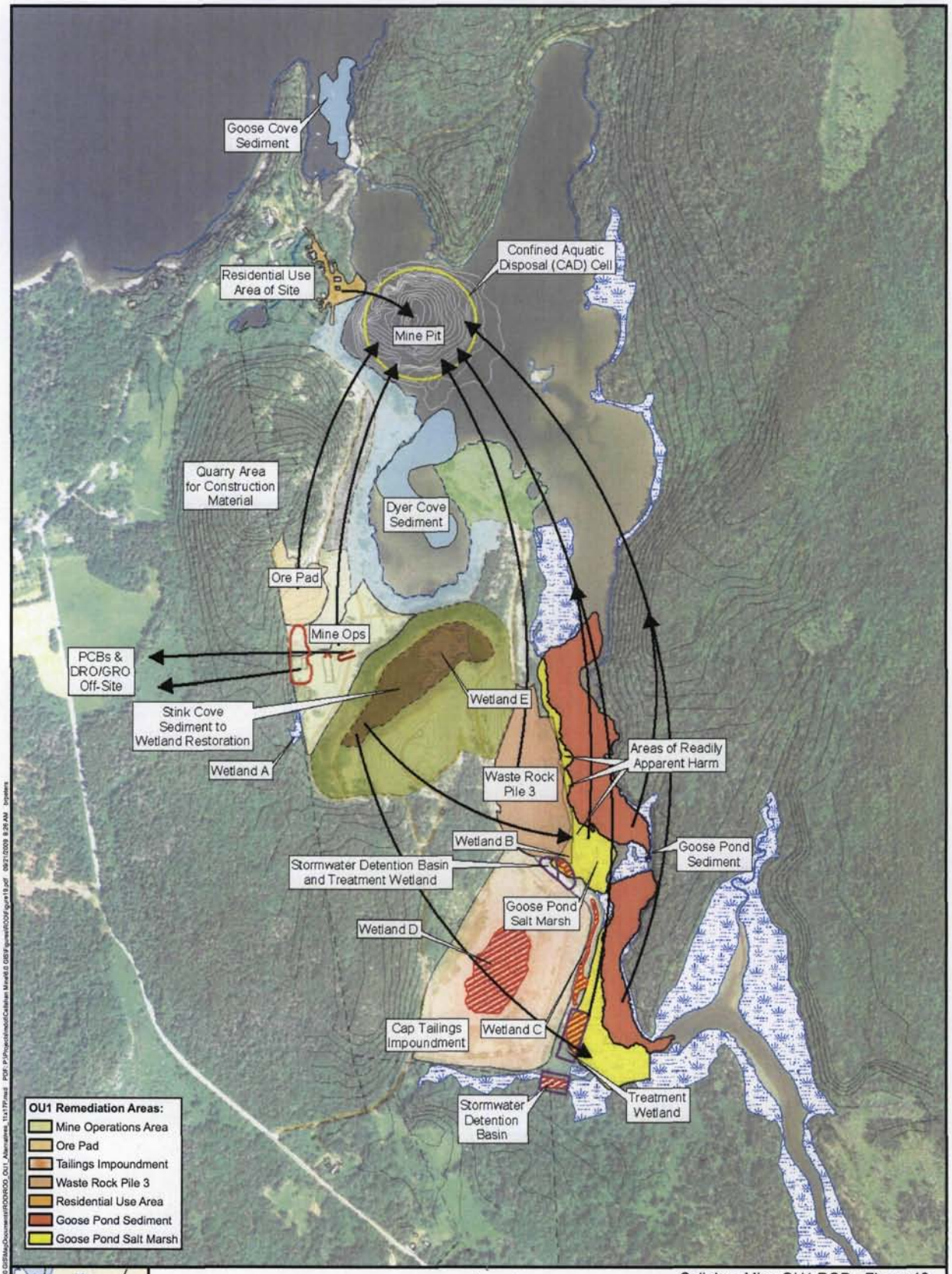
Callahan Mine OU1 ROD - Figure 18
Highlights of Tier II Evaluation

Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.



Legend

Bathymetric Contour

Delineated Wetlands

Area of Permanent Wetland Loss

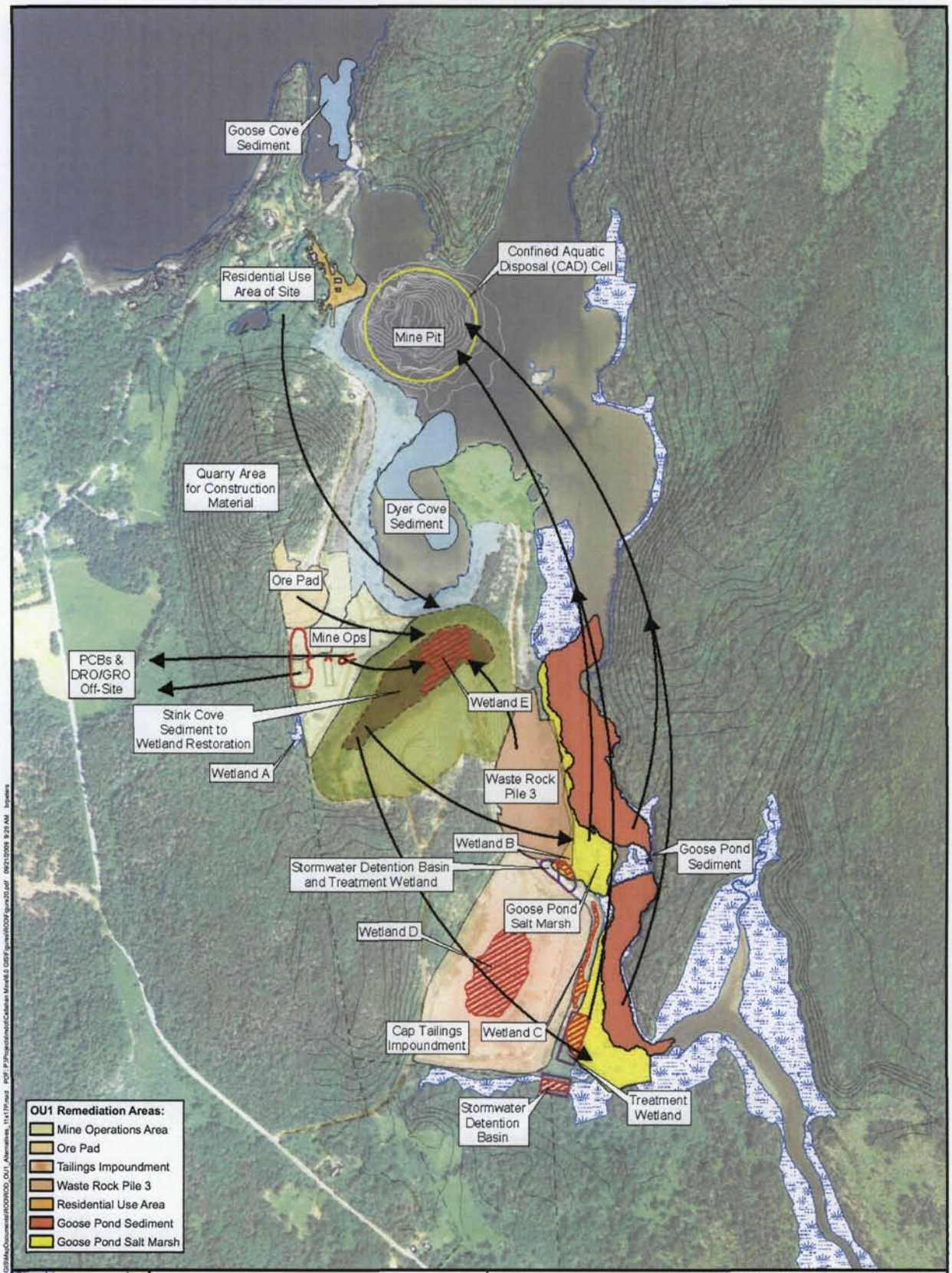
N

0 250 500 Feet

Prepared/Date: BRP 09/21/09 | Checked/Date: SWR 09/21/09

Callahan Mine OU1 ROD - Figure 19
Alternative CMS2
Proposed Remedy Map

Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.



Legend

Bathymetric Contour

Delineated Wetlands

Area of Permanent Wetland Loss

N

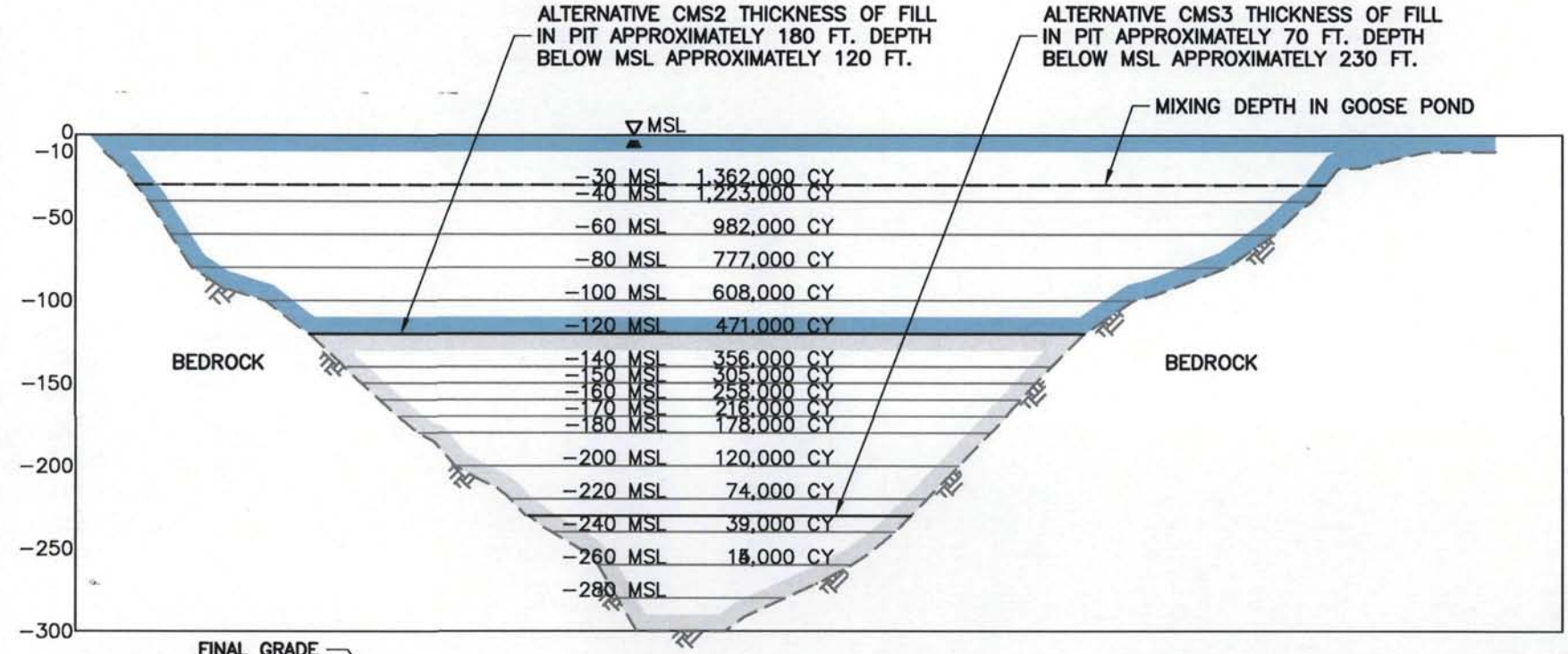
0 250 500 Feet

Prepared/Date: BRP 09/21/09 | Checked/Date: SWR 09/21/09

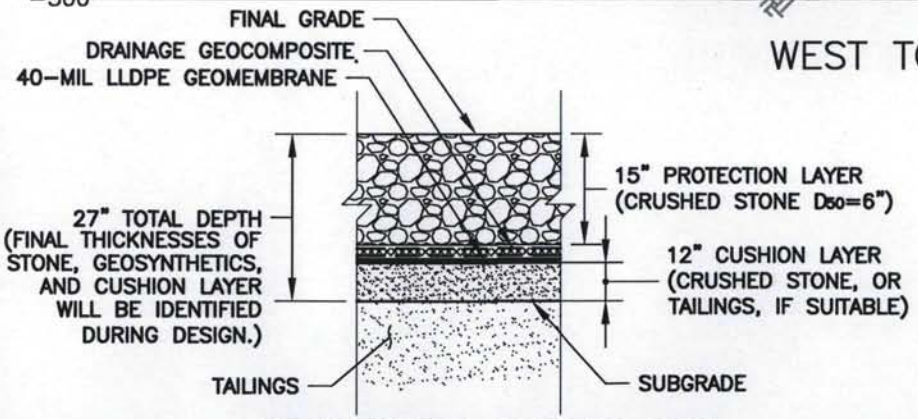
Callahan Mine OU1 ROD - Figure 20
Alternative CMS3
Proposed Remedy Map

Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.

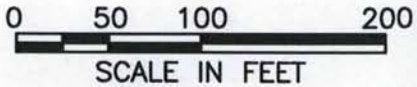
M:\Projects\Callahan Mine Site\OU1 ROD\Figure 21.dwg Mon, 21 Sep 2009 – 2:50pm rjriquier



WEST TO EAST CROSS–SECTION THROUGH MINE PIT

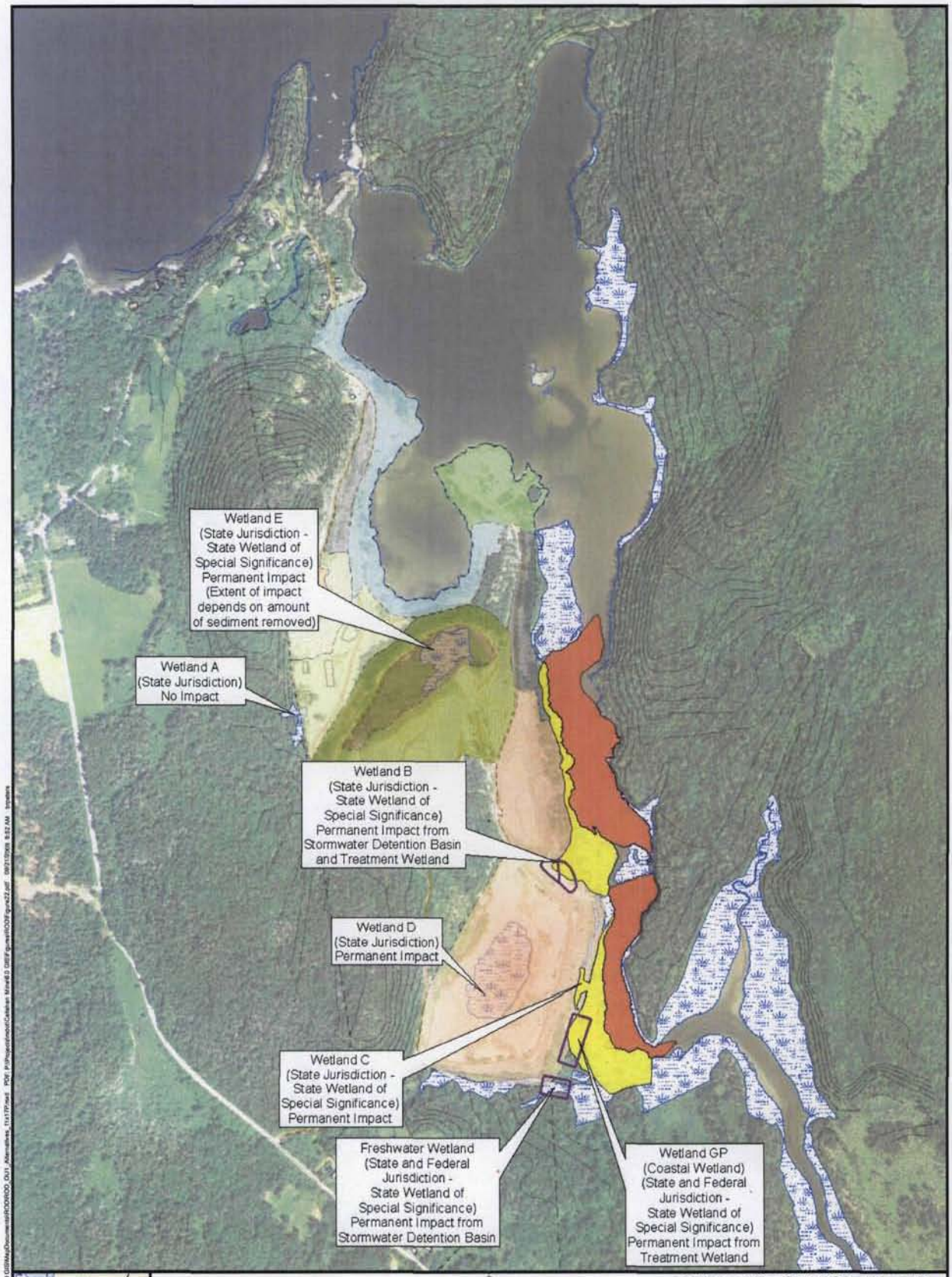


INFILTRATION BARRIER CAP
NTS



Prepared/Date: RJR 09/18/09
Checked/Date: SR 09/18/09

CALLAHAN MINE SUPERFUND SITE BROOKSVILLE, MAINE Project 3612-06-2047.32	MACTEC	CALLAHAN MINE OU1 ROD - FIGURE 21 CAD CELL AND TAILINGS IMPOUNDMENT COVER SYSTEM



Note:
Final jurisdictional status to be determined by Maine DEP and USACE.

Legend

- Goose Pond Remediation Area
- Salt Marsh Remediation Area
- Delineated Wetlands

N

0 250 500 Feet

Prepared/Date: BRP 09/21/09 | Checked/Date: SWR 09/21/09

Callahan Mine OU1 ROD - Figure 22
Alternative CMS2
Wetland Impacts

Callahan Mine Superfund Site
Brooksville, Maine
MACTEC, Inc.

APPENDIX B
State of Maine
Letter of CONCURRENCE

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN ELIAS BALDACCI
GOVERNOR

DAVID P. LITTELL
COMMISSIONER

September 28, 2009

Mr. James T. Owens, III, Director
Office of Site Remediation & Restoration
U.S. Environmental Protection Agency
1 Congress Street
Suite 1100, (HIO)
Boston, MA 02114-2023

Subject: Callahan Mine Superfund Site, Brooksville, Maine

Dear Mr. Owens:

The Maine Department of Environmental Protection (MEDEP) has reviewed the September 2009 Record of Decision Summary (ROD) with regard to the Selected Remedy for soils, sediments and waste rock at the Callahan Mine Superfund Site located in Brooksville, Maine.

Based on the Draft Final ROD review, the MEDEP is pleased to concur with the Selected Remedy, for Operable Unit 1 (OU-1) for the Site. The Selected Remedy mitigates the risks posed by on-site wastes. The major components of the Selected Remedy are listed below:

- Performance of pre-design investigations and studies;
- Construction of surface water diversions to reduce the amount of upslope runoff flowing onto and infiltrating the Tailings Impoundment;
- Installation of a low-permeability cover system to contain and isolate the Tailings Impoundment (cover material to be quarried from on-site);
- Installation of a horizontal drain, or other drainage methods (e.g., vertical wells or drains), to facilitate the dewatering of the Tailings Impoundment and the collection and treatment of the discharge from the horizontal drain, or other drainage methods (e.g., vertical wells or drains), in a constructed wetland (It is possible that additional measures, including a toe shear key or buttress would be identified during design as a necessary component to stabilize the Tailings Impoundment);
- Subaqueous disposal of Waste Rock Pile-3, Ore Pad, and Mine Operations Area source material, and Residential Use Area soil exceeding cleanup levels in a confined aquatic disposal (CAD) cell in the submerged former mine pit in Goose Pond;

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PORTLAND, MAINE 04103
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web site: www.maine.gov/dep

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- Excavation and off-site disposal of material contaminated with polychlorinated biphenyls (PCBs) exceeding site-specific PCB cleanup levels and petroleum-contaminated soil commingled with CERCLA waste;
- Dredging and subaqueous disposal of sediments exceeding the sediment cleanup levels from southern Goose Pond and the adjacent salt marsh into the CAD cell in the former mine pit;
- Mitigation, restoration, and compensation for wetland impacts, including the dredging and subaqueous disposal of Dyer Cove and Goose Cove sediments that contain mine waste in the CAD cell in the submerged former mine pit, along with other measures that may be identified in remedial design;
- Implementation of institutional controls to prevent disturbance to the components of the remedy and long-term monitoring of compliance with the restrictions;
- Installation of monitoring wells;
- Performance of long-term operation and maintenance, and monitoring, including institutional control inspections; and
- Performance of five-year reviews to continue to evaluate potential human-health and ecological risks due to exposure to contaminated waste material being permanently managed on-site.

This concurrence is based upon the MEDEP's understanding that at the completion of the remedy for OU-1, the residual risk posed by Operable Unit 2 (OU-2) will be reexamined and addressed separately if needed.

In addition, the MEDEP understands that the State is obligated to pay ten percent (10%) and that the EPA will contribute ninety percent (90%) towards the implementation of this remedy. The State of Maine will assume responsibility for the operation and maintenance of the site following completion of the selected remedy (see attached letter from EPA dated May 13, 2009).

The MEDEP will cooperate with EPA on any future institutional controls that may be necessary to implement the remedy.

The State of Maine also concurs with EPA's decision to implement an Early Action for OU-2. The Early Action would consist of the implementation of land use restrictions to prevent future residential use or groundwater consumption for the former Callahan Mine property portion of the Site.

The MEDEP has worked collaboratively with EPA and the Maine Department of Transportation since the site's inclusion on the National priorities List. Overall it has been a successful partnership and the MEDEP looks forward to continuing with our excellent working relationship with EPA at this site in the future as the remedy is implemented and institutional controls are

developed. If you need additional information, do not hesitate to contact myself or members of my staff at (207) 287-2651.

Sincerely,

Mark Hyland, Director
Bureau of Remediation & Waste Management

pc: Mary Jane O'Donnell, EPA
Edward Hathaway, EPA
David W. Wright, MEDEP
Theodore E. Wolfe, MEDEP
Naji Akladiss, MEDEP

CallahanRODconcurrenceltr(4).doc

APPENDIX C
RESPONSIVENESS SUMMARY

CALLAHAN MINE SUPERFUND SITE
RECORD OF DECISION
RESPONSIVENESS SUMMARY

PREFACE:

The purpose of this Responsiveness Summary is to document EPA's responses to the questions and comments raised during the public comment period. EPA considered all of the comments summarized in this document before selecting a final remedial alternative to address contamination at the Site. Attachment A to the Responsiveness Summary contains a copy of the transcript from the public hearing held on Thursday, August 6, 2009 at the Brooksville Town Office in Brooksville, Maine. All of the original comments submitted by citizens and the State of Maine are included in the Administrative Record.

This Responsiveness Summary addresses comments pertaining to the OU1 Proposed Plan, the OU1 Feasibility Study Report, and the Administrative Record for the Callahan Mine Superfund Site that were received by EPA during the comment period from July 10 to September 10, 2009. Several individuals, Federal and State agencies and officials, the consultant (Stantec Consulting Services, Inc.) for the technical assistance grant (TAG) group (Maine Environmental Research Institute), and others submitted comments to EPA either in writing or at the public hearing. The majority of the comments were supportive of the cleanup. The two comments critical of the cleanup suggested that the cleanup be phased and that the ecological risk based components be delayed or not be implemented.

SUMMARY OF COMMENTS FROM FEDERAL, STATE AND LOCAL AGENCIES AND OFFICIALS, AND FROM INDIVIDUALS

Comments from Federal Agencies:

a. National Oceanic and Atmospheric Administration (NOAA):

Comment: First expressing full support for the proposed cleanup plan, NOAA had three questions. It is unclear if the cell will be capped or if it will remain open given that the mixing depth is approximately 90 feet above the proposed final fill surface.

> *EPA Response: The design will include a sediment cover over the material placed in the CAD cell. It is likely that a cover using the former Stink Cove clean sediment that was stockpiled at WRP-1 in the 1960s by the mining company. The clean sediment cover would be installed over the material deposited in the CAD cell.*

Comment: NOAA asked for a brief summary on why EPA believes that the mixing depth is at 30 feet below mean sea level, in order to confirm that the contamination is isolated from the surface water.

EPA Response: The information in the Administrative Record, particularly the OU1 RI/FS, support a finding that the water within the former mine pit is stratified with depth. The information collected by the United States Geological Survey suggests that the temperature, salinity, and oxygen stratification occurs at about 30 feet below mean sea level. The depth of the material to be disposed of within the former mine pit will be well below this depth.

Comment: Is WRP-3 the principal source of the southern Goose Pond sediment contamination, or is the Tailings Impoundment the more important source?

EPA Response: The primary source for the contaminated sediment is believed to be the historic mining operations. The area of southern Goose Pond was used as a settling basin for tailings. In addition, overflow from the Tailings Impoundment would have also accumulated in the salt marsh and areas upstream of the dam. WRP-3 and the Tailing Impoundment are ongoing sources for additional metal loading to the sediment and surface water.

b. Bureau of Indian Affairs/Penobscot Nation

Comment: Remediation of the Site will not affect the Penobscot Nation.

EPA Response: Comment noted. Under historic preservation standards that apply to the Site cleanup, if any archeological resources are identified that may be of interest to the Nation, consultation with the applicable authorities will be carried out.

Comments from State and Local Officials:

a. Maine Department of Environmental Protection (Maine DEP)

Comment: The State of Maine provided oral testimony at the August 6, 2009 public hearing and submitted written comments in support of the cleanup plan (see testimony by Mark Hyland, Director of Bureau of Remediation and Waste Management, Maine DEP (Attachment A to this Responsiveness Summary) and Maine DEP's letter of concurrence (Appendix B of the OU1 ROD)).

Response: The Maine DEP has been a significant partner in completing the OU1 RI/FS and selecting a cleanup approach for the Callahan Mine Superfund Site. EPA greatly appreciates the hard work and support of the Maine DEP.

b. State Representative Jim Schatz

Comment: Representative Schatz requested a second 30 day extension of the public comment period.

EPA Response: EPA extended the comment period for an additional 30 days, from August 10 to September 10, based on a request by Representative Schatz and others at the July 9 public informational meeting. Based on the input from other community members, EPA determined that a second 30 day extension was not warranted.

Comment: We have been told there is no evidence of measurable adverse environmental impacts outside the 150 acre "halo" around the Site. Of course, it would be better if the hazardous metals were not in the environment, but there is nothing in the report describing any dramatic actual/specific impact on the quality of life existing in that area.

EPA Response: It is good news that the contamination is not more widespread and that the majority of the area surrounding the former Callahan Mine property have not been impacted. There are, however, several residential properties that have been impacted and the resolution of this contamination of their property is both dramatic and does impact the quality of life. In addition, the level of PCBs on-site represents a current threat to any visitor. The OU1 Remedial Investigation Report, including the Baseline Ecological Risk and Human Health Risk Assessment, documented the contamination and threats posed by the contamination at the Site. EPA needs to reiterate that it is obligated to address threats to the environment under the Superfund law and EPA's statutory mandate is to protect both human health and the environment.

Comment: I appreciate that the ten men *et al.* that sat before us Thursday night [at the August 6, 2009 public hearing] will continue their effort to define and design this project with, hopefully, some citizen oversight. However, at the risk of sounding cynical, I am not interested in providing job security to a group of professionals who seem to operate outside a context that considers relative public benefit and appears to assume the availability of unlimited resources.

EPA Response: Comment noted. EPA is clearly aware of the limited resources available to the Federal, State, and local governments. The cleanup plan was developed as the most cost effective approach to protect public health and the environment with extensive input from Federal, State, and local officials; the public; and experts in a wide variety of fields, including mine remediation, marine environments, and dredging/subaqueous disposal.

Comment: I know that funds available to remedy environmental problems are scarce. Hence, we want to be sure that the problems we address in this state and, for that matter, in this country address the most urgent environmental repair needs.

> *EPA Response: EPA has a national prioritization protocol for cleanup actions to make sure that the most significant threats to human health and the environment are funded first.*

Comment: Specifically, there is no doubt that any mine site that has been subjected to close to almost $5,000,000 of scientific study, as this one has been, would create data suggesting the need for remediation. I do support the finding that there is a need to immediately address the presence of PCBs and lead/arsenic contaminants on the road and properties close to the former Callahan Mine property. However, the suggestion that a $23 million fix in "today's dollars" is required to produce a net environmental benefit commensurate with the potential risks existing within the 150 acre project area seems to be more a reflection of the needs and interests of the professionals engaged in this exercise than the public's sense of a need for protection. It should also be noted that when Ed Hathaway, EPA project manager, referred to the estimated costs to be in "today's dollars," he went on to explain that a similarly priced project in Vermont ended up costing $40 million when it finally reached the top of the EPA's priority list and the engineering and design work were completed.

> *EPA Response: Comment noted. EPA agrees that the PCB and lead/arsenic contamination should be addressed as soon as possible. The cost to address the remaining components of the remedy are consistent with the expense of remediating the large volume of mine waste and contaminated sediment that is posing risks above CERCLA action levels at the site. It is possible that the estimated cost will increase as greater detail about the cleanup is developed during the design and due to inflation that may occur between the issuance of this ROD and the implementation of the remedy (the timing for this is dependent on nationwide Superfund funding priorities)*

Comment: Many of the questions presented at this meeting [on August 6, 2009] and many prior meetings have gone unanswered because, according to the EPA, "Answers to those questions won't be available until the engineering and design phases are complete."

> *EPA Response: EPA has made substantial efforts to address the questions and issues raised at the public meetings. The OU1 FS evaluated many local concerns, including truck traffic. In addition, EPA provided a panel of experts to answer questions regarding the cleanup plan. EPA received generally positive feedback from these meetings, and many individuals expressed an opinion that their questions had been satisfactorily addressed. Under the NCP, the ROD only develops a general description of the remedy, and the more detailed components of the remedy are developed during Remedial Design. EPA will continue to consult with the public as this post-ROD design phase proceeds.*

Comment: The comments encouraged the rapid implementation of the first two elements of the proposed cleanup action: (1) excavation and disposal of PCB waste; and (2) excavation and cleanup of the Residential Use Area containing lead and arsenic contamination.

EPA Response: EPA agrees that these two current threats to human health should be addressed as soon as possible.

Comment: I would ask that the remaining six elements of the plan be reconsidered and placed in a "No Action" status until it can be established that the net environmental benefit of that portion of the project exceeds the benefits that might be gained by using the scarce resources of the EPA and the State of Maine elsewhere.

EPA Response: EPA does not agree with this comment. The other elements of the cleanup will address the ongoing ecological impacts, stabilize the tailings impoundment, and eliminate the major source of groundwater contamination. The No Action alternative is not a technically or legally defensible approach, based on the threats to human health and the environment identified at the Site. The selected remedy meets all Superfund criteria for addressing the human health and ecological risks posed at the Site.

c. Town of Brooksville Selectboard:

Comment at Hearing: Daryl Fowler, a member of the Selectboard expressed concerns about the trucking of material, road damage, and asked who would pay to repair the damaged roads.

EPA Response: EPA will work closely with the Selectboard to develop the traffic safety plan and address any road impacts that may be directly related to the Site activities.

Comments from Individuals:

Comment: The majority of individuals (Spear, A.&J. Sandecki, Fassnacht, Holmes (representing the Bagaduce Watershed Association), Hunter, K. Sandecki, Betts, Ganem, Gray, Veague, Borg, Cedquaid, and Meyer) expressed support for the cleanup and emphasized their desire for the cleanup to occur as quickly as possible. Many of these comments were provided by local residents who will be impacted by the implementation of the cleanup. A petition signed by many of the adjacent and nearby residents (seasonal and year round) also expressed strong support for the cleanup and further articulated that the community had a strong interest in the removal of both the mine waste from Goose Cove and the dam structure in Goose Pond at Goose Falls. Several commenters noted that boaters during low tide and scallopers often disturb the sediments in Goose Cove and likely cause the dispersal of contaminants.

EPA Response: EPA appreciates the support for the cleanup. The selected remedy formalizes the removal of the mine waste in Goose Cove as a component of the wetland mitigation. The final ecological restoration, post sediment removal, will assess whether the removal of the dam would improve the hydrology of the Site to promote restoration of impacted habitats. EPA cannot definitively indicate whether the dam removal can occur as a part of the cleanup.

Comment (Spear): The cleanup plan I am supporting here is one that is designed expressly for wildlife conservation and/or passive recreation—not for any use Maine DOT might see fit to engineer. Given that agency's role in the cleanup process—and its history of subverting environmental policies—I feel compelled to put this concern on the record. I am advised that the best course will be for the town and the State (Maine DEP) to enact protective zoning so that when this degraded property (bordering state park land) changes hands, it will not be misappropriated.

EPA Response: EPA will focus on the cleanup of the Site consistent with its statutory and regulatory mandate. The future use of the Site must not damage the cleanup or result in any new threats to human health or the environment from the Site waste material. The landowner may use the Site in any manner consistent with the cleanup, including any activities that don't violate the CERCLA land use restrictions and state/local regulations.

Comment (Spear): I ask that the dredging equipment and trucks used in the cleanup of the Site be upgraded and/or fueled by alternatives to diesel, so that we will not be trading one set of cancer risks for another (and increasing respiratory disease).

EPA Response: EPA will evaluate the extent to which alternative fuel vehicles can be used as part of the cleanup. EPA completely agrees that the cleanup should use energy efficient and low emission technologies to the extent practical.

Comment (Spear): Callahan should be on the priority list when the next round of money is allocated. Although it is essential to remediate all toxic-waste sites on the Superfund list, preference should NOT be given to the projects closest to completion, as happened in disbursement of $600 million in 2009 stimulus funding; rather, the first to be targeted must be those that pose the greatest hazard to humans and the environment.

EPA Response: EPA has a national prioritization evaluation to make sure that the cleanup funds go to the most significant threats to public health first. If another round of economic stimulus funding is authorized by Congress, the prioritization process for such funding is currently unknown. However, the issuance of this ROD permits funding to be authorized to implement the selected remedy when any source of federal Superfund funding becomes available.

Comment (Spear): I live a few hundred yards from the Callahan Mine Superfund Site, and I support EPA's plan to clean up the toxic metals and PCBs that have caused devastating damage to vegetation, water, and wildlife (and quite possibly to humans) over several decades. This hazardous waste threatens far more catastrophic harm if left unaddressed. Because people and the environment are at high risk at the Site (a report by the Center for Public Integrity ranks the Site as among the most dangerous of all Superfund designees), I urge that this cleanup be fast tracked and that every effort be made to reinstate the "polluter-pays" corporate tax to fund it.

EPA Response: EPA appreciates the comment in support of the cleanup plan.

Comment (Spear): The Site should be secured to deter vandals.

EPA Response: Site security is the responsibility of the landowner, not EPA. The landowner has fenced off the area where PCBs pose a human health risk. The remaining areas of the former mine do not pose a human health risk from recreational exposure levels to Site contaminants.

Comment (Spear): Do your conclusions on this part of the cleanup (that the chosen remedy is the least damaging practicable alternative to protect wetland resources) take into account the wetlands-mitigation strategies you plan to implement?

EPA Response: Yes, based on a review of anticipated wetland impacts that will require mitigation, as well as public comments in support, EPA is including the wetland mitigation measure of the removal of mine wastes from the subtidal areas of Dyer and Goose Coves as a component of the remedy. Additional wetland mitigation, restoration or compensation measures may be taken to protect wetland resources, and any such measures will be evaluated in the Remedial Design.

Comment at Hearing (Spear): I very much hope that as we see truck traffic in the years ahead, there will not be attempts to straighten out the beautiful contours of these winding roads. I think that by establishing speed limits and other types of what you call institutional controls, that kind of action can be avoided.

EPA Response: EPA does not plan on altering any roadways in order for trucks to be able to access the Site. EPA has selected a remedy that minimizes, to the extent practicable, the truck traffic needed to implement the remedy. EPA will coordinate truck traffic issues with State and local officials.

Comment (A.&J. Sandecki): The Callahan firm planted long-needled white pines to screen their operations along the Goose Pond causeway and Weir Cove's easterly sides. They have died, and with the consent of the property owners, these pines could be removed and the area reforested with some indigenous plant life that would reestablish the Goose Falls causeway's once beautiful and unobstructed view of Goose Pond.

EPA Response: EPA will evaluate what vegetative restoration activities will be needed to address the mine reclamation standards for the Site. It is not known if this may include replacing the pine tree screen that the commenters are interested in.

Comment (A.&J. Sandecki): The commenters support using a floating screen and auger suction to dredge the sediments from Goose Cove if it is presently the most effective method so as not to disperse these sediments into the larger waters of Penobscot Bay.

EPA Response: EPA will determine during the Remedial Design the most effective and environmentally protective means to remove the mine waste from Goose Cove and Goose Pond and to deposit the contaminated sediments into the former mine pit CAD cell.

Comment (Hunter): There is a need for more water access for people in the area to be able to "get to the water."

EPA Response: The Remedial Action to be conducted by EPA does not address public access to the water. Dredging operations and the potential removal of barriers to navigation as part of the remediation may improve access. Shoreline access is at the discretion of the landowners at the Site.

Comment (Ganem): Capping the tailings in place will not move the problem soils somewhere else, and while I understand many residents' concern about the amount of trucking necessary to accomplish the remediation, I believe it to be short-sighted not to stabilize the cap with loam and vegetation. An extensive bed of riprap will eventually give rise to a very weedy setting, ripe for invasive plants to take hold.

EPA Response: EPA evaluated alternatives to address the Tailings Impoundment, and after balancing all of the Superfund criteria determined that the best alternative was to cap the area in place. The volume of material was determined to be too great to move. Due to the extensive area of the cap, there is not enough cover soils on site to permit the establishment of a vegetative cover over the area. The number of trucks loads of material that would need to be delivered from off-site to establish a vegetative cover was determined to be prohibitive. Long-term operation and maintenance of the cap, which will be the responsibility of the State, will ensure that invasive plants are not permitted to become established on the cover. As part of the design, EPA will evaluate whether on-site materials could be used to establish a vegetative cover on the Tailings Impoundment.

Comment (Ganem): I would urge you to consider putting in place a permanent conservation easement on the full 550-acre study area to ensure future protection of the restored natural resources.

> *EPA Response: As part of the Superfund remedy, institutional controls will be implemented to protect people from contaminant risks left on-site and to prevent disturbance to components of the remedy, including the cap, monitoring wells, and the treatment wetland. Under an Early Action for OU2, EPA plans on requiring restrictions on residential development and drinking water wells within the former Callahan Mine property. It is not within the scope of the Superfund remedy to require the landowners to place conservation easements on their properties.*

Comment (Jacobs): The commenter expressed doubt that the stabilization of the rock dike at the Tailings Impoundment was necessary.

> *EPA Response: The geotechnical evaluation completed as part of the Feasibility Study concluded that the long-term stability of the rock dike does not meet the safety criteria established by the Maine Mine Rules and standard engineering practice. Dam type structure can appear quite sound, yet still fail. The selected remedy identifies that the rock dam must achieve the required stability criteria, but retains substantial flexibility as to the approach to achieve the stabilization. If the design analysis supports that the rock dam is, in fact, able to meet the criteria, then no further stabilization may be necessary.*

Comment (Jacobs): Movement of the material from the Tailings Impoundment into the pit will spread the material, will allow contamination to flow into the bay, and will contaminate a larger area.

> *EPA Response: The materials to be relocated at the Tailings Impoundment are expected to remain in the Tailings Impoundment. The remedy includes the relocation of Waste Rock and sediment, but not tailings. EPA fully recognizes that tailings have geotechnical properties that require careful planning before relocation. The sediment and erosion control measures that will be in place during remedy implementation will be design to minimize any material transport off the Site.*

Comment (Jacobs): The placement of the sediment in the pit, closer to the bay, will allow the material to flow into the bay.

> *EPA Response: The placement of the material in the deep pit will actually remove the material from future movement into the bay. The depth of burial will be below the mixing zone. It is correct that the CAD cell is closer to the bay than the current location of the contaminated waste rock and sediment. It is also*

correct that there is mine waste currently in the bay, at Goose Cove, as result of the mine relate disposal activities. The sediment and erosion control measures that will be in place during remedy implementation will be designed to minimize any material transport off the Site.

Comment (Jacobs): How will the discharge of the sediments through a chute be controlled to avoid residuals flowing out of the area or material backing up in the chute? Could the chute rise to a higher level and spew residue all over the place? How will the dredging account for the manner in which the sediments flow when disturbed?

EPA Response: The sediment and erosion control measures that will be in place during remedy implementation will be designed to minimize any material transport off the Site. In addition, EPA and the United States Army Corps of Engineers have substantial experience with dredging operations. The United States Army Corps of Engineers provided technical support to EPA in the development and evaluation of the cleanup alternatives. The implementation would be performed to avoid such issues as loss of control or excessive release of sediment into Goose Pond or Goose Cove.

Comment (Jacobs): Filling the pit will bring pollution from deeper in the pit closer to the surface.

EPA Response: There may be some limited amount of sediment that is released during deposition. Preliminary evaluations suggest that the sediment and contamination should settle quickly and remain at the bottom of the CAD cell. The Remedial Design will evaluate the best placement strategy to minimize any release during implementation.

Comment (Jacobs): How will the damage to the wetlands, above and under, the water be addressed?

EPA Response: The Remedial Design will identify all of the wetland areas to be impacted, both in the short-term and permanently. EPA has included mitigation for the wetland impacts in the remedy. One component of the wetland mitigation will be the removal of mine waste from Goose Cove and Dyer Cove. Other measures may also be implemented once the extent of permanent impacts is well defined and a mitigation plan is developed. In addition, the remedy will result in a significant net benefit to the wetland systems at the Site. The current conditions include about 7 acres of contaminated salt marsh wetland that represents a threat to shoreline feeding birds. In addition, the 10 acres of mine waste contaminated sediment is also an ecological threat to birds, fish, and the benthic community. Upon completion of the remedy, a better physical habitat will exist due to the removal of the contaminated mine waste that has filled the bottom of Goose Pond

Comment (Jacobs): How will the cleanup deal with the two concrete discharge towers in

the tailings pond?

EPA Response: The Remedial Design will include a contingency plan in the event the excavation/dredging exposes these structures. In addition, the Tailings Impoundment closure design will also focus on the proper abandonment of the former decant structures.

Comment (Jacobs): The cleanup is based on a lot of assumptions with little regard to the potential disastrous consequences.

EPA Response: The Administrative Record, which includes the OU1 Remedial Investigation and Feasibility Study (RI/FS), contains a substantial amount of information that supports the selection of the remedy. EPA must strike a balance between collecting sufficient information to allow for a cleanup decision and incurring additional cost and delays associated with further studies. EPA is confident that the cleanup plan represents a reasonable scientific and engineering approach to address the contamination at the Site. The only disastrous consequence would be to leave the contamination in place and to ignore the stability concerns with the Tailings Impoundment.

Comment (Jacobs): There is no definite proof that all our health problems came from the mine, only speculation. They could have been caused by lead and galvanized piping, asbestos, other environments, to name a few. Now, however, we are told the sky is falling by the EPA, my question is how did we get by all this time if things are so bad?

EPA Response: EPA evaluates current and future potential exposures to human health and the environment. The ability to identify a particular illness as caused by a previous exposure to the mine material is very difficult. The State Department of Public Health or the Agency for Toxic Substances and Disease Registry (ATSDR) can be of assistance in performing such evaluations. It should be noted that under the Superfund law, the trigger for taking action takes into account the contaminant levels in the environment and the potential pathways that individuals may be exposed to the contaminant. The trigger for conducting a Superfund cleanup is not tied to proving that individuals in a community adjacent to a Superfund site have proven health problems caused directly by the Site. At the Callahan Mine Superfund Site, the contaminant levels are high enough and potential exposure pathways exist to justify taking the Remedial Action described in this ROD.

Comment (Jacobs): Correcting problems to adjacent landowners, such as cleaning up the PCBs and cordoning off unsafe areas, would be more than ample. Private property owners should have some reasonable say in the matter.

EPA Response: EPA agrees that the cleanup of the PCBs and the lead/arsenic contamination at the residential properties should be a high priority. While EPA

does take all comments into consideration in developing the cleanup plan, the Site owners do not get to decide whether EPA can select the cleanup plan. The owner of the former Callahan Mine portion of the Site chose not to comment on the cleanup plan. The owner of the subtidal areas of the Site, the State of Maine, is in support of the cleanup plan, as documented by the concurrence of the Maine DEP. The residential landowners are strongly in support of the cleanup. With respect to physical hazards, EPA is not authorized to address physical hazards that are not a component of the response to hazardous substances, pollutants, or contaminants.

Comment (Jacobs): The shear size of the project in years and cost is staggering. The costs could increase and there are more important needs facing the country.

EPA Response: The selected cleanup is a large project. The Site covers over 150 acres, including Goose Pond, and contains several million tons of waste. The cost and duration of the remedy are a reflection of the large quantity of material that must be subject to remediation. The funding for other national, state, and local issues is a matter for their respective legislatures. Under Congress' funding of EPA, the Agency makes best efforts to efficiently and effectively use the resources that are made available, including funding, to protect human health and the environment.

Comment (Jacobs): Another concern not being taken seriously enough is the safety factor during construction, with respect to the unprecedented amount of large truck traffic on roadways clearly not designed to accommodate them.

EPA Response: EPA has taken the issue of truck traffic very seriously, both in terms of public safety and potential road impacts. The selected remedy uses on-Site material to the greatest extent possible and also uses flexibility permitted under the mine closure regulations to minimize the need for off-site import of material (e.g., topsoil). The estimated number of trucks needed to complete the selected remedy is 2000. This number drops to about 1000 if the material for the passive treatment wetland can be found on-site. When spread over several months, the daily truck traffic can be managed with a well implemented traffic plan. Moreover, in the development of the FS, EPA screened out of consideration alternatives that relied on the transport off-site of waste material (except for a limited amount of PCB and petroleum contaminated waste), partly due to the shear number of truck trips that would be required.

Comment (Jacobs): We are being asked to approve a plan, that by the EPA's own admission, is not completely engineered and the full impact not known.

EPA Response: EPA believes that there has been a reasonable discussion about the engineering of the plan and the potential impacts and that the design phase will provide more details about the cleanup. EPA developed an Administrative

Record, including the OU1 Proposed Plan and Feasibility Study, that provided a sufficient level of technical information for the public to evaluate the proposed cleanup plan. The fundamental aspects of the cleanup plan (the threat to human health and the environment; compliance with ARARs; cost; short-term and long-term impacts; long-term effectiveness and permanence; and implementability) were all well documented in the Administrative Record. The public has provided comment, and EPA has selected a cleanup plan that is based on the Administrative Record, including public comment. The Remedial Design is when EPA will refine the selected remedy and more specifically address many of the issues regarding the implementation of the remedy. EPA will continue to work closely with the community. The Superfund process provides for an opportunity for additional public comment if the cleanup must be changed in any fundamental way.

Comments from TAG Consultant (Stantec):

Comment: On balance, Stantec could support either of the two remedial options (CMS2 and CMS3) that were presented as alternatives to CMS1, the "do nothing" alternative. Further, the selection of CMS2 in the OU1 Proposed Plan seems appropriate for the reasons cited therein.

EPA Response: EPA agrees that both CMS2, the selected remedy, and CMS3 could achieve the cleanup objectives. CMS2 was chosen as the selected remedy due to a greater degree of long-term effectiveness and lower cost.

Comment: Stantec agrees with the concept of subaqueous disposal as being a viable option for the permanent storage or disposal of mine wastes. We did not see any discussion of settlement analyses that have been conducted, or are planned, that may be necessary to design a delivery system that eliminates the possibility of mine wastes escaping the subaqueous cell. The text should be revised to include a discussion of any settlement analyses that have been performed or is planned to ensure that all waste materials are permanently placed below the mixing zone of the pit.

EPA Response: EPA agrees with the need for the design to identify measures that will minimize the possibility of mine waste escaping the CAD cell. This analysis will be part of the Remedial Design which will be conducted after the issuance of this ROD.

Comment: Do Mining Rules (or other ARARs) require the establishment of a Self-Sustaining Ecosystem (or equivalent) on reclaimed mining units (i.e., waste rock piles, tailing impoundments, etc.) as they do in some other states (i.e., New Mexico, etc.)? The current alternatives would leave the capped areas with crushed stone surfaces in perpetuity.

EPA Response: No, the State of Maine mining rules do not require a self-sustaining ecosystem.

Comment: How would areas of impacted soil or waste material excavation be restored (i.e., backfilling for positive drainage, loaming, seeding, crushed stone, etc.)?

EPA Response: The restoration of excavated areas will vary with each area. Residential properties will be restored to as close to existing grades and quality as prior to the excavation. The Ore Pad and WRP-3 may not require any backfill and may only require some topsoil for restoration. The Remedial Design will determine the manner of restoration for each area. Critical issues will be to limit erosion and establish good post cleanup drainage.

Comment: The text in Section 4.2.1 [of the OU1 FS Report] suggests that "the removal of waste material at the Ore Pad will address the most significant source of groundwater contamination and contribute to the overall protection of future users of the groundwater" and that "[t]he excavation of Ore Pad, Mine Operations Area, and WRP-3 source material followed by its disposal in the CAD cell in the former mine pit below the mixing depth, would eliminate the contribution of those materials to exceedances of NRWQC in Goose Pond surface water and to salt marsh and sediment contamination that exceeds ecologically protective concentrations." While these statements may be technically true, one might conclude that they mean that there will be no source material left behind that could impact groundwater or ecological receptors. The text should include a discussion as to whether source material will remain capable of creating groundwater impacts above MCLs due to leaching, or ecological impacts, if soils are remediated to recreational PRGs as proposed.

EPA Response: There will clearly be a substantial quantity of waste rock that remains outside the Tailings Impoundment cap or CAD cell. This material will be evaluated under OU2. The objective of the OU2 RI/FS will be to determine what additional source control measures may be necessary to achieve groundwater restoration. The OU2 ROD may also conclude that groundwater restoration is not practicable.

Comment: Institutional controls as part of an OU2 Early Action are discussed in Section 6.0 [of the OU1 FS Report]. The institutional controls as presented are intended to prevent residential development or groundwater use within the former Callahan Mine portion of the Site. Figure 6.0-1 shows the northern boundary of the area of institutional controls to end where the residential use area begins. Figure 2.4-6, however, shows that areas of soil above residential PRGs will remain in the area labeled as the residential use area (see Figure 2.4-1) following the planned removal action in the residential use area. The text should be modified to resolve this apparent conflict. For instance, will institutional controls be extended to incorporate the portion of the residential use area where soil above residential PRGs may remain following the removal action? Additionally, a statement should be added that affirms the implicit determination of the

Maine DOT that residential groundwater use beyond the boundary of the institutional controls would not lead to unacceptable risks.

> *EPA Response: Upon completion of the cleanup of the Residential Use Area, this area should be safe for unrestricted use of the locations from a soil perspective. No institutional controls were planned or would be necessary as a result. Both figures 2.4-1 and 2.4-6 of the OU1 FS Report show the area that will be subject to the soil cleanup. The sample locations that highlighted as exceeding the PRG but outside the area identified for excavation are primarily arsenic, with one detection of lead. These areas will be re-sampled during the remedial design to better define whether these are isolated an isolated detection of lead or arsenic or a more extensive area. There should not be any risk from exposure to soil/waste in this area upon completion of the cleanup. No unacceptable risk from the ingestion of groundwater from Site contamination has been identified beyond the proposed boundary of the institutional controls. Currently, one well outside of the former mine property requires treatment. The OU2 RI/FS will ascertain whether the exceedance of drinking water standards at this well is from Site contamination and, if so, how the groundwater within this area will be addressed under the final OU2 ROD.*

Other Comments.

Comment: Several business/organizations (Sweet Assoc., MDIBL) expressed an interest is working with/for EPA during the cleanup.

> *EPA Response: EPA will assess its needs for contractors/research partners to engage in the Remedial Design and Remedial Action phases of the project some time after this ROD is issued.*

THE SELECTED REMEDY'S CHANGES TO THE PROPOSED PLAN MADE BASED UPON PUBLIC COMMENTS

There have been no significant changes to the selected remedy from the OU1 Proposed Plan as a result of public comments. The public was supportive of the OU1 Proposed Plan. The State of Maine and TAG group (MERI) were both supportive of the OU1 Proposed Plan. Overall, most comments were in general agreement with the proposed cleanup plan and offered comments/suggestions to modify the approach to make sure the residential cleanup is undertaken as soon as possible and the Goose Cove mine waste removal is part of the cleanup. The public's suggestion that the Goose Pond dam at Goose Falls be removed as part of the remedy will be evaluated during the design phase to determine whether its removal will contribute to the implementation of the remedy.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
1 Congress Street, Suite 1100
BOSTON, MA 02114-2023

MEMORANDUM

Date: **September 30, 2009**

Subject: **Early Action for Operable Unit 2 at the Callahan Mine Superfund Site, Brooksville, Maine**

From: **Mary Jane O'Donnell, Chief**
ME/VT/CT Superfund Section
Office of Site Remediation and Restoration (OSRR)

To: **Site File**

SITE NAME AND LOCATION

Callahan Mine Superfund Site
Brooksville, Hancock County, Maine
MED980524128
Site ID No: 0101028
Operable Unit 2

STATEMENT OF BASIS AND PURPOSE

This memorandum documents EPA's decision to implement an Early Action for Operable Unit 2 (OU2) at the Callahan Mine Superfund Site in Brooksville, Maine (the Site). The Early Action is being implemented in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA), 42 USC § 9601 *et seq.*, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, as amended (NCP). EPA will finalize the Early Action as part of the OU2 Record of Decision to be issued at a later date.

The Early Action decision is based on the information contained in the Administrative Record for the OU1 Record of Decision (ROD), which was developed in accordance with Section 113(k) of CERCLA, and which is available for review at the Brooksville Library, Brooksville, Maine, and at the EPA OSRR Records Center in Boston, Massachusetts.

The Maine Department of Environmental Protection (Maine DEP) supports the implementation of the Early Action.

A description of EPA's proposed Early Action for OU2 was included in the Proposed Plan for OU1, which was issued for public comment. No public comments were received in opposition to the proposed Early Action.

SUMMARY OF SITE CONDITIONS THAT WARRANT EARLY ACTION

OU2 for the Callahan Mine Superfund Site will address all site-wide threats relating to groundwater, soil, sediment, and biota. The OU2 RI/FS will continue until the risk reduction accomplished by OU1 can be assessed, or predicted, to allow OU2 to identify the need for any additional remedial action at the Site.

The OU1 Remedial Investigation (RI) Report and Human Health Risk Assessment (HHRA) for the Site documented the presence of Site related hazardous substances in the groundwater and soil at levels that would not allow for unrestricted use. The HHRA conclusions for the OU2 are listed below:

Soil

For current recreational use of the former Callahan Mine portion of the Site, after removal of the PCB contamination as a result of the implementation of OU1, the cancer, non-cancer, and lead IEUBK model output for exposure to soil would be within the EPA acceptable risk level. No groundwater use or shellfish consumption[1] was assumed under the current recreational Site use.

For future residential use of the former Callahan Mine portion of the Site, after removal of the PCB contamination as a result of the implementation of OU1, the noncancer risk from exposure to lead in soil was assessed using the IEUBK model which estimated a mean blood lead level of 9.5 μg/dl and that 45.8% of the population would have a blood lead level above 10 μg/dl. This would exceed the EPA policy threshold to protect 95% of the sensitive population against blood lead levels in excess of 10 μg/dl blood. Tables 1 and 2 present the estimated cancer and non-cancer risk estimated for the future resident scenario for the OU1 ROD.

Groundwater

For future residential use of the former Callahan Mine portion of the Site, the installation of a water supply well and consumption of groundwater would result in an unacceptable risk to human health. Table 3 present the groundwater data and risk levels from exposure to contaminated groundwater.

Sediment/Biota

Based on a request from EPA, the Agency for Toxic Substances and Disease Registry (ATSDR) reviewed the clam tissue results for the Site. ATSDR provided a health

[1] The State has imposed a ban on the harvest of clams, oysters, and mussels along the coast in the Harborside area due to pollution. The ban includes all of Goose Cove and Goose Pond. See Closed Area No. 36, Bagaduce River and Harborside (Castine, Penobscot, Brooksville) (DMR Chapter 95.04(C))."

consultation report to EPA on October 24, 2008 that contained the following conclusions and recommendations:

- Exposures to lead contaminated clams could potentially result in harmful health effects in children if current fishing restrictions are lifted in the area.
- The levels of lead in cooked clam tissue samples exceeded the FDA safety tolerance level and the maximum value of lead found in the total diet study.
- The average levels of lead in cooked clam tissue samples from the Site ranged from 0.67-28 mg/kg. The maximum lead concentration in cooked tissue was 37.4 mg/kg in a single run. Those levels are within the same order of magnitude as the data ATSDR reviewed in June 2008.
- The decision to use the IEUBK model to determine PRGs is a regulatory decision and beyond the scope of ATSDR's public health evaluation of the site-specific exposure scenario. ATSDR understands that when deriving site-specific PRGs for lead, EPA also considers aspects such as site-specific variability in exposure, lead geochemistry, and projected land use. EPA may also factor in other considerations such as cost, technical feasibility, compliance with state and federal regulations, and community acceptance.
- ATSDR recommended to EPA that individuals continue to adhere to the fish and shellfish consumption restrictions and advisories that already exist in the area.

The OU1 remedy will address the major threats to public health and the environment. Figure 4 from the OU1 ROD, which is attached, shows the areas of the Site. Under the current Site land use assumptions for the former Callahan Mine portion of the Site (which are recreational use, no shellfish consumption, and no consumption of groundwater) the OU1 Human Health Risk Assessment did not identify a threat to human health. Nonetheless, it is possible that prior to the issuance of the OU2 ROD, the shellfish ban could be removed, a residence could be constructed, or a water supply well could be installed within the OU2 area. This could result in the consumption of clams, oyster, and mussels within Goose Cove and Goose Pond, exposure to soil, or groundwater ingestion that could result in the transition of several future potential unacceptable threats to current threats. These include:

- If the former Callahan Mine portion of the Site, which is currently undeveloped, were to be subject to residential development, then the levels of lead would exceed the EPA acceptable risk threshold for residential exposure to lead.
- If water supply wells were to be installed within the former Callahan Mine portion of the Site, there would be an unacceptable threat from ingestion of groundwater.
- If the prohibition on harvesting clams, oyster, and mussels were to be removed, it is possible that individuals could consume shellfish at a frequency that could result in an unacceptable threat from ingestion of lead contaminated shellfish.

EARLY ACTION FOR OU2

In order to protect the public from an unacceptable threat to human health that would occur if land use were to change at the Callahan Mine Superfund Site, EPA is implementing an Early Action to implement land use restrictions to prevent future residential use and to prevent the

installation of water supply wells. The land use restrictions will be in the form of a restrictive covenant that will be placed on the former Callahan Mine property, with local and/or State ordinances or zoning to supplement the property restriction. EPA also is incorporating the current State of Maine ban on the harvesting of clams, oysters and mussels as a component of the OU2 CERCLA remedy.

These measures can be taken now, well ahead of the time that a final remedy will be selected for OU2 of the Callahan Mine Superfund Site, to ensure that human health is protected from identified risks at the Site. This Early Action is consistent with any future remedial measures that may eventually be selected for OU2.

Figure 5 from the OU1 ROD, which is attached, shows the area that would be subject to land use restrictions to prevent future residential use or groundwater use within the former Callahan Mine portion of the Site using existing data. The design for this Early Action will identify the extent of the former Callahan Mine property portion of the Site that exceeds the residential cleanup levels for arsenic and lead identified in the OU1 selected remedy and the extent of groundwater that exceeds MCLs, MCLGs, MEGs, or risk-based standards in the absence of these. Table 4 lists the soil cleanup levels established in the OU1 ROD. Figures 8 and 9 from the OU1 ROD are also attached to show the extent of groundwater contamination and the areas to be addressed by OU1. The State's harvest ban on clams, oysters, and mussels encompasses all of Goose Pond and the areas of Goose Cove within OU2.

Table 1
Non-Carcinogenic Human Health Risk from OU1 Record of Decision
Future Exposure to Soil within Former Callahan Mine Portion of Site

Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (1-6 years old)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Source Area Soil Waste	PCB-Aroclor 1242	Immune system/ immunotoxicity	180	-	70	250
			PCB-Aroclor 1248	Immune system/ immunotoxicity	160	-	64	224
			Arsenic	Keratosis (skin)	2	0.0006	0.2	2.2
			Lead	CNS/PNS		-	-	
			Thallium	Liver	0.2	-	-	0.2
							Soil Hazard Index Total =	476
							Receptor Hazard Index =	476
							Maximum Tissue-Specific Hazard Index =	474

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
CNS/PNS: Central Nervous System/Peripheral Nervous System
NOEL: No Observed Effect Level

Risk Characterization

This table is from the OU1 Record of Decision and provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 476 indicates that the potential for diverse noncancer effects could occur from exposure to contaminated soil containing PCBs. The maximum tissue-specific hazard index is 474 for effects of PCBs on Immune system/ immunotoxicity and 2 for arsenic.

The OU1 remedy will remove the risk associated with exposure to PCBs. The lead risk described below will remain after completion of the OU1 remedy.

The noncancer risk from exposure to lead in soil was assessed using the IEUBK model which estimated a mean blood lead level of 9.5 ug/dl and that 45.8 percent of the population would have a blood lead level above 10 ug/dl. The maximum tissue-specific hazard index is 2 for Keratosis (skin) due to exposure to arsenic arsenic.

Table 2
Carcinogenic Human Health Risk from OU1 Record of Decision
Future Exposure to Soil within Former Callahan Mine Portion of Site

Risk Characterization Summary – Carcinogens

Scenario Timeframe: Future Receptor Population: Resident **Receptor Age:** Child (1-6)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Source area soil/waste	PCB – Aroclor 1242	$6x10^{-4}$	$5x10^{-9}$	$2x10^{-4}$	-	$8x10^{-4}$
			PCB – Aroclor 1248	$6x10^{-4}$	$5x10^{-9}$	$2x10^{-4}$		$8x10^{-4}$
			Arsenic	$8x10^{-5}$	$7x10^{-9}$	$7x10^{-6}$		$8x10^{-5}$
			Lead					
							Soil Risk Total for young (1-6 year old) child	**2×10^{-3}**

Scenario Timeframe: Current **Receptor Population: Resident** **Receptor Age:** Adult (age 7-30 years old)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)[1]	Exposure Routes Total
Soil	Soil	Source area soil/waste	PCB – Aroclor 1242	$3x10^{-4}$	$8x10^{-9}$	$1x10^{-4}$	-	$4x10^{-4}$
			PCB – Aroclor 1248	$2x10^{-4}$	$7x10^{-9}$	$1x10^{-4}$		$3x10^{-4}$
			Arsenic	$3x10^{-5}$	$8x10^{-9}$	$3x10^{-6}$		$3x10^{-5}$
			Lead					
							Soil risk for adult	**$8x10^{-4}$**
							Soil risk total for adult and child=	**$3x10^{-3}$**

Key
— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.
PCB: Polychlorinated biphenyls

Risk Characterization

This table is from the OU1 Record of Decision and provides risk estimates for exposure to soil within the former Callahan Mine portion of the Site to a future resident. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adult's exposure to ground water, as well as the toxicity of the COC (arsenic). The total risk from direct exposure to contaminated soil, including inhalation of dust, at this Site to a current recreational visitor ranges from 2×10^{-3} for a young child to 8×10^{-4} for an adult. A person living on the Site as a child and adult over a thirty year period would have a carcinogenic risk of 3×10^{-3}. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 3 in 1000 of developing cancer as a result of site-related exposure to the COCs.

The OU1 remedy will remove the risk associated with exposure to PCBs. An excess cancer risk due to arsenic of 1.1×10^{-4} will remain after completion of the OU1 remedy.

Table 3
Summary of Groundwater Threats to Human Health
Assuming Future Use of Groundwater

	EPC (mg/L)	MCL (mg/L)	MCLG (mg/L)	EPA Health Ad-visory (mg/L)	MEG (mg/L)	Future potential excess Cancer Risk	Future potential non-cancer Risk Hazard Quotient	Background Total (mg/L)
Overburden Groundwater								
Aluminum	86	NA	NA	NA	1.43		6	0.377
Antimony	0.008	0.006	0.006	NA	0.003		1.3	ND
Arsenic	0.0452	0.010	0	NA	0.010	3.7E-04	10	ND
Cadmium	1.2	0.005	0.005	NA	0.0035		170	0.0029
Chromium	0.144	0.100	0.100	NA	0.040		4	ND
Copper	0.848	1.3	1.3	NA	1.3		1.4	0.0821
Lead	1.13	0.015	0	NA	0.010		>EPA action level	0.012
Manganese	7.75	NA	NA	0.3	0.5		22	0.0744
Thallium	0.0014	0.002	0.0005	NA	0.0005		1.1	ND
Vanadium	0.0917	NA	NA	NA	NA		1.3	ND
Zinc	98.5	NA	NA	NA	2		21	0.706
Bedrock Groundwater								
Arsenic	0.005	0.010	0	NA	0.010	4.1E-05	1.1	ND
Cadmium	0.165	0.005	0.005	NA	0.0035		23	0.0029
Copper	14.1	1.3	1.3	NA	1.3		23	0.0821
Manganese	9.75	NA	NA	0.3	0.5		27	0.0744
Zinc	42.9	NA	NA	NA	2		9	0.706

The background data are provided in Appendix A of the OU1 RI Report and are based on bedrock groundwater.
NA - Not Available
ND - Not Detected
mg/L - milligrams per liter
EPC - Exposure Point Concentration
MCL - USEPA Maximum Contaminant Level
MCLG - USEPA Maximum Contaminant Level Goal
MEG - Maine CDC Maximum Exposure Guidelines for Drinking Water
HI - Hazard Index

Table 4

Clean Levels for Soil from OU1 Record of Decision

	Back-ground (mg/kg)	Soil Cleanup Level (mg/kg)	Basis	Risk at Cleanup Level HQ / ELCR
Residential Cleanup Level				
Arsenic	14	14	Background	HQ = 0.2 ELCR = 5.8×10^{-6}
Lead	37	375	Maine State Safe Lead level and site-specific IEUBK model output	Using this level as the maximum concentration, then 95% of exposed population should have a blood lead level that does not exceed 10 µg/dl based on this cleanup level.
Polychlorinated biphenyls	Not applicable	1	TSCA and site-specific risk basis to allow for unrestricted future use	HQ = 0.4 ELCR = 1.9×10^{-6}
Thallium	0.12	15	Site-specific risk basis for noncancer exposure	HQ = 1 ELCR = n.a.
				HI = 1.6 Cumulative ELCR = 7.7×10^{-6}
Recreational Cleanup Level				
Arsenic	14	30	Risk-management decision to accept 1×10^{-5} ELCR for arsenic	HQ = 0.2 ELCR = 1.2×10^{-5}
Lead	37	700	Maine Remedial Action Guideline[1] and site-specific IEUBK model output	95% of exposed population should have a blood lead level that does not exceed 10 µg/dl based on this cleanup level.
Polychlorinated biphenyls	Not applicable	1	TSCA and site-specific risk basis to allow for unrestricted future use	HQ = 0.1 ELCR = 0.8×10^{-6}
				HI = 0.3 Cumulative ELCR = 1.2×10^{-5}

Notes:
All concentrations = mg/kg
HI = hazard index,
HQ = hazard quotient;
ELCR = excess lifetime cancer risk
[1] Maine DEP, Implementation of Remedial Action Guidelines, Table 4 – Remedial Action Guidelines for Contaminated Soils

UNITED STATES OF AMERICA

ENVIRONMENTAL PROTECTION AGENCY

IN RE: CALLAHAN MINE SUPERFUND SITE

Public Hearing at the BROOKSVILLE TOWN OFFICE

ORIGINAL

Reported by Ronald G. Veno, a Notary Public in and for the State of Maine, on August 6, 2009, at the Brooksville, Maine Town office, Brooksville, Maine, commencing at 8:45 p.m.

MODERATOR: MARY JANE O'DONNELL

1 TRANSCRIPT OF PROCEEDINGS
2 MS. O'DONNELL: We're here in terms of this
3 hearing, it's really to formally accept your
4 comments on the cleanup proposal. Hopefully all of
5 you have seen this, read it, digested it and as Ed
6 had mentioned, it is in the library here so if you
7 don't have a copy, that's where you should perhaps
8 go to get one.
9 I think Pam mentioned or Ed mentioned the
10 close of the comment period is September 10th. We
11 will accept all oral comments we get tonight, all
12 written comments that we receive by the 10th. We
13 will evaluate those comments, carefully consider
14 them and make changes to the cleanup proposal as
15 needed. Our responses to all those comments will be
16 in a document that will be in the library at some
17 point in the future once we make our cleanup
18 decision.
19 I know a lot of you have been to a number
20 of our other meetings previously, this hearing is
21 unlike that from a couple of perspectives. One as
22 you can see, it's recorded -- being transcribed.
23 Secondly, because it is a formal hearing,
24 we won't respond to your questions that you may have
25 during the hearing, however, certainly we will be

1 available after the close of the hearing to respond
2 to any other questions that may come up.
3 And then finally, as the hearing officer, I
4 guess I reserve the right to sort of limit the
5 length of some of the comments that may occur, and
6 that is just to insure that everyone here gets an
7 opportunity to speak. If the need arises, I will
8 limit to comments to five minutes, however,
9 certainly if you want to provide us with a written
10 comment, that's fine.
11 And then once everyone has a chance to
12 speak, I will then go back and give you another
13 opportunity to finish your comment if you'd like.
14 When I do open the floor for comments, I will ask
15 you to come to the front, I would ask you to stand
16 up, identify yourself and your association with the
17 site.
18 Ed is going to give a short presentation in
19 which he's going to describe the cleanup proposal,
20 the EPA's rationale for the proposal and some of the
21 next steps. So with that as background, hopefully
22 there aren't any questions, I'm going to turn things
23 over to Ed.
24 MR. HATHAWAY: You have all seen this.
25 This is the public hearing for the proposed cleanup

1 for the Callahan Mine. As we have presented many
2 times before, what we found was the highest level of
3 contamination were found in areas associated with
4 the former mine operations. EPA is proposing a
5 cleanup action to address current residential use.
6 The current residential use area contains mine waste
7 and soil with lead and arsenic above levels
8 acceptable for long term exposure. PCB's in mine
9 operations are above levels acceptable for human
10 contact. Ore Pad is the most significant source of
11 groundwater contamination. Ore Pad and mine
12 operations are contributing to surface water
13 contamination. Tailings impoundment dam does not
14 meet acceptable stability criteria.
15 Seeps from waste rock pile three and
16 tailings impoundment contain concentrations of
17 copper and zinc well above levels considered
18 acceptable for aquatic biota. The sediments in
19 southern Goose Pond contain mine waste and very high
20 levels of copper, lead and zinc.
21 The area represents a threat to biota of
22 Goose Pond due to acute toxicity demonstrated in
23 toxicity testing in two of three locations in the
24 mine area. Food chain modeling that identified a
25 potential threat to insect feeding shore birds and

1 fish eating birds in this area. Elevated levels of
2 copper, lead and zinc in the tissue of clams and
3 fish in this area.
4 We have set up a series of objectives,
5 remedial action objectives. Prevent extended
6 contact now and in the future with soil or waste
7 containing PCB's above residential and recreational
8 cleanup levels. Prevent contact now and in the
9 future with soil or waste containing lead or arsenic
10 above the residential cleanup levels in the
11 residential use areas of the site. Prevent exposure
12 of biota to sediment including sediment soil in the
13 salt marsh with concentrations of copper, lead, or
14 zinc that may represent a threat to insectivorous
15 and piscivorous birds, fish and other aquatic
16 organisms. Minimize impacts from waste rock and
17 tailings within the OU1 area on groundwater, surface
18 water and sediment. Stabilize the tailings dam to
19 achieve acceptable stability criteria. Comply with
20 federal and state regulations that apply to the
21 cleanup action.
22 Early cleanup action is proposed for OU2.
23 Prevent future residential use of the former
24 Callahan Mine property portion of the site due to
25 the presence of lead above levels acceptable for

1 long-term residential exposure. Prevent future use
2 of the groundwater within the former Callahan Mine
3 property portion of the site due to the presence of
4 arsenic, cadmium, copper, lead, manganese and zinc
5 above federal or state drinking water or groundwater
6 criteria.
7 The human health cleanup levels that are
8 being proposed for residential use for PCB's is one,
9 recreational use for PCB's is one. For lead for
10 residence use 375 milligrams. For recreational it's
11 700. Arsenic, residential 14 milligrams, for
12 recreational use, 30 milligrams per kilogram.
13 For ecological cleanup, proposed cleanup
14 level for copper and sediment and soil is seven
15 hundred ninety milligrams per kilogram. For lead
16 it's seven hundred ten, and for zinc it's five
17 thousand one hundred.
18 EPA wants to identify short term impacts on
19 wetlands at the site. We do not expect wetland A
20 impacts. We do expect short term impacts during
21 dredging and excavation, that will be migrated by
22 restoration of these areas, however some permanent
23 loss of wetlands will occur for use in the cover
24 system like sediment basins and for the passive
25 treatment wetland. Wetland mitigation will be

1 included in the design and remediation to address
2 partial loss of wetlands B or C.
3 Wetlands D and E on top of the tailing
4 impoundment. We expect complete loss of these
5 wetlands. EPA has evaluated the requirements of the
6 applicable regulations including Section 404 of the
7 Clean Water Act and identified the proposed cleanup
8 actions as the least damaging practicable
9 alternative to protect federally regulated wetland
10 and aquatic resources from exposure to contaminated
11 sediments and contaminated surface water. As
12 required by the federal Executive Order 11990
13 entitled Protection of Wetlands, public comment is
14 sought regarding wetland impacts.
15 We're also making a public notice of
16 determination that the PCB cleanup level is
17 protective of human health. EPA has made a finding
18 under the Toxic Substances Control Act, PCB
19 regulations at 40 CFR Part 761, that the cleanup
20 levels established for PCB's at this site will be
21 protective of human health and the environment. PCB
22 proposed cleanup level of one parts per million will
23 meet the standard under TSCA and site specific risk
24 assessment.
25 EPA evaluated three alternatives. One was

1 no action. Two essentially was consolidated
2 material in the pit. Alternative three was
3 consolidate the sediments in the pit and create a
4 cap for the tailing pile and cap for the mine waste.
5 We found alternatives both two and three protective
6 of human health and would comply with federal and
7 state regulations, therefore they meet our threshold
8 criteria.
9 We found the no action alternative fails
10 these critical criteria. When we've looked further
11 at our five balancing criteria, long term
12 effectiveness, alternative 2 was the best because
13 the disposal in the mine pit is in fact the most
14 effective long term solution for the sediment.
15 Alternative three has good -- good levels of long
16 term effectiveness but reliance on cap maintenance
17 creates a slightly less level of protectiveness.
18 Short term effectiveness of both meaning
19 disturbance to the community would be the same for
20 both. The reduction of toxicity, mobility or volume
21 for treatment would only be accomplished through the
22 use of passive treatment. Costs are lower for
23 alternative two by about three million dollars and
24 therefore through all of EPA's criteria, alternative
25 two was identified as the best balance of

1 alternatives that meet our threshold criteria.
2 Once again the proposed alternative two is
3 to -- is to have tailings impoundment cover system,
4 stability measures and horizontal drain. PCB hot
5 spot removal for residential yard cleanup for lead
6 and arsenic. Waste rock area 3 removal and
7 subaqueous disposal in the CAD cell. Southern Goose
8 Pond and salt marsh sediment removal and subaqueous
9 disposal in CAD cell. Ore Pad mine ops area waste
10 removal and subaqueous disposal in CAD cell. Land
11 use restrictions to protect cover system to prevent
12 disturbance of the CAD cell. Long term monitoring,
13 maintenance, and five year reviews. Estimated
14 present value 22.8 million dollars with a note that
15 Dyer Cove and Goose Cove are under consideration for
16 mine waste removal as part of wetlands restoration.
17 Activities or mitigation. Early cleanup
18 action identifies this area dashed in red as an area
19 where land use restrictions would need to be put in
20 place to prevent future residential use, prevent
21 installation of water supply wells, and prevent
22 ingestion of groundwater.
23 Sixty day comment period ends
24 September 10th. 2009. Cleanup decision and
25 response to comments by end of September. Please

1 send any comments postmarked by September 10th to
2 me, Ed Hathaway, USEPA Region 1, 100 Congress
3 Street, Boston, Massachusetts, 02114. You may also
4 send comments before the close of business on
5 September 10, 2009, by e-mail to
6 hathaway.ed@epa.gov.
7 All the information that we have used for
8 this cleanup action is available at the library at
9 the EPA record center. They're also available at
10 the office of Maine DOT, and DEP office as well.
11 And that's it. That's the end of my presentation.
12 I will now turn it over to Mary Jane for the
13 hearing.
14 MS. O'DONNELL: As I mentioned before, now
15 I'd like to open the floor to comments. I guess
16 I'll start on this side of the room. If you could
17 just stand up, identify yourself and if you have any
18 comments, we can read it and you can add it to the
19 record. Anyone on this side?
20 AUDIENCE MEMBER: I think the EPA has done
21 a very thorough job. Albert Sandecki. Harborside.
22 I think EPA has done a very fine job in their
23 testing and work that they've done for the past two
24 and a half, three years that I'm familiar with, and
25 I have submitted my concerns and observations to

1 them by letter two or three weeks ago.
2 MS. O'DONNELL: Thank you. Anyone else on
3 this side?
4 AUDIENCE MEMBER: Sally Borg, Harborside.
5 One of the trustees of Harborside, really the trust
6 which is an abutter, and I am writing but I'll just
7 say for the hearing that we appreciate all this work
8 and we support the proposed solution and we also
9 appreciate all the comments that people are giving
10 and we look forward to seeing them incorporated.
11 MS. O'DONNELL: Thank you. Anyone else?
12 Yes, sir in the back.
13 AUDIENCE MEMBER: Daryl Fowler, Selectman
14 of Brooksville. One of our concerns as selectman
15 and for the town is that there will be some
16 mechanism for the mechanics of the trucking out of
17 the material, you know. There will be quite a bit
18 of road damage and whatnot and we'd just like to
19 make sure that there are some funds available to
20 repairing any town roads that are damaged and
21 whatnot because once the cleanup is done,
22 everybody's gone, we're left with -- I'm not saying
23 there won't be, I just would like to get it on
24 record that we would like to have some mechanism for
25 this.

1 MS. O'DONNELL: Okay. Thank you. Anyone
2 else? Mark.
3 AUDIENCE MEMBER: Good evening. Mark
4 Hyland, Director of Bureau of Remediation and Waste
5 Management for Maine Department of Environmental
6 Protection. The department has worked closely with
7 both USEPA and Maine Department of Transportation
8 during the development of both remedial
9 investigation and feasibility study of the Callahan
10 Mine site. I'd like to offer the following comments
11 on the USEPA's proposed cleanup action. This plan
12 is designed to minimize both human health and
13 ecological risks posed by mining waste left on the
14 site following termination of mining activities in
15 1972.
16 The Callahan Mine site has been divided up
17 into two operable units. As you've heard this
18 evening from Ed, the Maine DEP understands that this
19 plan consolidates the most serious risks into
20 operable unit one which is being addressed in the
21 proposed plan.
22 The Feasibility study identified several
23 possible cleanup options. Based on our knowledge of
24 the Callahan Mine site and the risks posed by the on
25 site waste, the Maine Department of Environmental

1 Protection concurs with the proposed cleanup
2 alternative identified as CMS 2. The Maine DEP
3 understands that Alternative CMS 2 will consist of
4 the following actions.
5 Pre design investigations and studies,
6 tailings impoundment improvements including
7 diversion of upslope surface water. Construction of
8 a low permeability cover system. Stabilization
9 measures as necessary. The installation of
10 horizontal drain system, and treatment of the
11 horizontal drain system discharge in a constructed
12 wetland.
13 Excavation and subaqueous disposal of waste
14 rock pile three, ore pad and mine operations area,
15 source material in the CAD cell in the former mine
16 pit.
17 Excavation of soil containing arsenic and
18 lead above cleanup levels in the residential use
19 area of the site and disposal in the CAD cell in the
20 former mine pit.
21 Excavation and off site disposal of
22 PCB-contaminated soil exceeding preliminary
23 remediation goals.
24 Excavation and off site disposal of
25 petroleum contaminated soil waste commingled with

1 CERCLA waste.
2 Dredging of Goose Pond and salt marsh
3 sediment exceeding PRG's and subaqueous disposal in
4 the CAD cell in the former mine pit.
5 Establishment of institutional controls to
6 protect the components of the remedy including all
7 caps, treatment wetlands, monitoring wells and CAD
8 cell itself.
9 Wetland restoration and mitigation.
10 Installation of monitoring wells.
11 Long term operation and maintenance
12 monitoring, including institutional control
13 inspections and five year reviews of the remedy.
14 This abandoned mining operation was never
15 properly closed. The site needs to be cleaned up
16 whether under the federal superfund or under a state
17 authority to prevent further environmental
18 degradation and to protect nearby residents.
19 Sediments in Goose Cove estuary register some of the
20 highest concentrations of metal contaminants found
21 along the entire coast bordering the Gulf of Maine.
22 As you've heard this evening, Maine DEP
23 believes that this option is the most cost effective
24 long term option available, and as part of this
25 effort the State has negotiated a very fair cost

1 sharing arrangement with EPA.
2 The Maine Department of Environmental
3 Protection also understands this remedy will comply
4 with federal and state applicable or relevant and
5 appropriate requirements commonly known as ARAR's.
6 And in closing I'd like to thank the
7 Technical Assistant Grant citizens group including
8 Machtech and Stantech, Representative Schatz and
9 other citizens for their input and comments on the
10 cost effective remedy for the risks posed by this
11 site. I'd also like to thank the staffs from EPA,
12 DOT, DEP, NOAA, U. S. Geological Survey and U. S.
13 Fish and Wildlife and also the Army Corps of
14 Engineers for your assistance. It's been a long
15 process for a lot of people. A lot of people worked
16 very hard on this to come up with a kind of a novel
17 solution. Thank you.
18 MS. O'DONNELL: Thanks. Yes, ma'am.
19 AUDIENCE MEMBER: Jody Speer. I was
20 waiting for that statement because I'm gratified to
21 know that the State Department of Environmental
22 Protection stands behind the plan. It seems very
23 thorough and from the conversation I've had with Ed
24 Hathaway, I feel that we are -- we have reason to
25 hope that it will be a responsible cleanup and we

1 can be thankful that it has been designated a
2 superfund site so that we don't have continued
3 degradation of the site and continued risk to
4 ourselves personally. I hope that I can persuade
5 everyone here to contact representatives at both
6 state and federal level to urge that the tax be
7 reinstated. That will mean that the corporate
8 polluters -- polluters pays tax back there, will be
9 taxed rather than us the taxpayers for cleanup of
10 superfund sites, and with enough pressure, we can
11 make that happen.
12 One comment about the roads. I very much
13 hope that as we see truck traffic in the years
14 ahead, there will not be attempts to straighten out
15 the beautiful contours of these winding roads. I
16 think that by establishing speed limits and other
17 types of what you call institutional controls, that
18 kind of action can be avoided. Thank you, very
19 much.
20 MS. O'DONNELL: Thank you. Anyone else?
21 Yes, sir.
22 AUDIENCE MEMBER: Bill Cedquaid,
23 Harborside. I just wanted to say I don't know it's
24 appropriate but the helpfulness that's been
25 demonstrated tonight, the friendliness and openness

1 of the government employees has I think been
2 excellent and deserves congratulations and notice
3 because it makes a big difference, so thank you all.
4 MS. O'DONNELL: Like I said, you can't
5 comment on the comments. Yes, ma'am.
6 AUDIENCE MEMBER: Sheila Myer, Harborside.
7 I want to thank you all for being here tonight and
8 I'm hoping that if this -- this cleanup solution is
9 approved that as the plan is developed that the
10 community also is -- we're -- many of us don't know
11 the technical details but that we're brought along
12 with what's happening.
13 MS. O'DONNELL: Thank you. Anyone else?
14 Well --
15 MR. HATHAWAY: Do any of the federal
16 agencies want to make any comments for the record?
17 PANEL MEMBER: I wrote a letter, just a
18 couple sentences. Despite the highest ecologically
19 based cleanup for copper, lead, zinc, that I am
20 aware, I believe the data collected under remedial
21 investigation. Report to CMS 2 alternatives, and I
22 had a few questions that have been answered tonight.
23 I will be submitting my comments.
24 AUDIENCE MEMBER: We'll be submitting our
25 comments.

MS. O'DONNELL: Well, thank you all for coming here tonight, participating in tonight's meeting. As I said before, it's been -- certainly been an education in terms of listening to all these experts, and I appreciate everyone's questions, it has helped a lot of us. The hearing is now closed.

1
2 CERTIFICATE
3 I, Ronald G. Veno, a Court Reporter and
4 Notary Public within and for the State of Maine, do
5 hereby certify that the foregoing is a true and
6 accurate transcript of the proceedings as taken by
7 me by means of stenograph,
8
9 and I have signed:
10
11
12
13 Ronald G. Veno
14 Court Reporter/Notary Public
15
16 My Commission Expires: August 21, 2015.
17
18 DATED:
19
20 .
21
22
23
24
25

APPENDIX D
ADMINISTRATIVE RECORD INDEX

Callahan Mining Corp.
NPL Site Administrative Record File
Record of Decision (ROD)

Index

Record of Decision Dated: September 2009
Released: October 2009

Prepared by
EPA New England
Office of Site Remediation & Restoration

Introduction to the Collection

This is the administrative record file for the Callahan Mining Corp. Superfund Site, Brooksville, Maine, Operable Unit 1 - Sitewide, Record of Decision (ROD), released September 2009. The file contains site-specific documents and a list of guidance documents used by EPA staff in selecting a response action at the site.

The administrative record file is available for review at:

EPA New England Office of
Site Remediation & Restoration
1 Congress Street, Suite 1100 (HSC)
Boston, MA 02114
(by appointment)
617-918-1440 (phone)
617-918-0440 (fax)
www.epa.gov/region01/superfund/resource/records.htm

Brooksville Free Public Library
1 Town House Road
Brooksville, ME 04617
207-326-4560 (phone)
http://www.brooksvillelibrary.org/

An administrative record file is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

Please note that the compact disc(s) (CD) containing this Administrative Record may include index data and other metadata (hereinafter collectively referred to as metadata) to allow the user to conduct index searches and key word searches across all the files contained on the CD. All the information that appears in the metadata, including any dates associated with creation of the indexing data, is not part of the Administrative Record for the Site under CERCLA and shall not be construed as relevant to the documents that comprise the Administrative Record. This metadata is provided as a convenience for the user and is not part of the Administrative Record.

Questions about this administrative record file should be directed to the EPA New England site manager.

CALLAHAN MINING CORP
AR Collection: 61272
SEPTEMBER 2009 ROD

AR Collection Index Report
For External Use

Phase 01: SITE ASSESSMENT

44324 HAZARD RANKING SYSTEM (HRS) PACKAGE

Author: US EPA REGION 1
Addressee:
Doc Type: REPORT
Doc Date: 07/16/2001 **# of Pages:** 1
File Break: 01.06

Phase 03: REMEDIAL INVESTIGATION (RI)

452647 THESIS ON IDENTIFICATION OF SULFIDE MINE CONTAMINATION USING LEAD ISOTOPES: A STUDY IN THE COASTAL MAINE COPPER DISTRICT

Author: ANDREW J BOECKLER UNIVERSITY OF NEW HAMPSHIRE
Addressee:
Doc Type: REPORT
Doc Date: 12/01/1996 **# of Pages:** 133
File Break: 17.07

44290 CONCEPTUAL MODEL AND REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS) STATEMENT OF WORK (SOW)

Author: METCALF & EDDY
Addressee: TRC COMPANIES INC
Doc Type: REPORT
Doc Date: 04/01/2003 **# of Pages:** 200
File Break: 03.03

44589 PUBLIC HEALTH ASSESSMENT

Author: US AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR)
Addressee: US DEPT OF HEALTH AND HUMAN SERVICES
Doc Type: REPORT
HEALTH/RISK ASSESSMENT
Doc Date: 04/17/2003 **# of Pages:** 47
File Break: 03.09

452600 REVISED FIELD SAMPLING PLAN (FSP) FOR REMEDIAL INVESTIGATION (RI)

Author: TRC ENVIRONMENTAL CORPORATION
Addressee:
Doc Type: REPORT
Doc Date: 11/01/2004 **# of Pages:** 343
File Break: 03.03

AR Collection Index Report
For External Use

Phase 03: REMEDIAL INVESTIGATION (RI)

452605 **CONCEPTUAL APPROACH TO THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)**

Author: MAINE DEPARTMENT OF TRANSPORTATION
Addressee: US EPA REGION 1
Doc Type: REPORT
Doc Date: 03/04/2005 **# of Pages:** 237
File Break: 03.06

452601 **SUMMARY REPORT: MARINE GEOPHYSICAL SURVEY, GOOSE COVE/GOOSE PONDS, BROOKSVILLE, MAINE**

Author: HYDROTERRA ENVIRONMENTAL SERVICES LLC
Addressee:
Doc Type: REPORT
Doc Date: 03/11/2005 **# of Pages:** 36
File Break: 03.04

452602 **GEOPHYSICAL INVESTIGATION [WITH TRANSMITTAL LETTER]**

Author: HYDROTERRA ENVIRONMENTAL SERVICES LLC
Addressee:
Doc Type: REPORT
Doc Date: 03/14/2005 **# of Pages:** 40
File Break: 03.04

452648 **FINAL INTERIM WORK PLAN NO. 1 FOR REMEDIAL INVESTIGATION (RI)**

Author: MACTEC ENGINEERING AND CONSULTING INC
Addressee: MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: WORK PLAN
Doc Date: 04/07/2005 **# of Pages:** 40
File Break: 03.07

236983 **DRAFT REMEDIAL INVESTIGATION (RI) DATA REPORT**

Author: METCALF & EDDY
Addressee: TRC ENVIRONMENTAL CORP
US EPA REGION 1
Doc Type: REPORT
SAMPLING DATA
Doc Date: 06/01/2005 **# of Pages:** 866
File Break: 03.02

CALLAHAN MINING CORP
AR Collection: 61272
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Phase 03: REMEDIAL INVESTIGATION (RI)

452649 **FINAL INTERIM WORK PLAN NO. 2 FOR REMEDIAL INVESTIGATION (RI)**

Author: MACTEC ENGINEERING AND CONSULTING INC
Addressee: MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: WORK PLAN
Doc Date: 06/23/2005 **# of Pages:** 148
File Break: 03.07

452650 **MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - JULY 15, 2005**

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 07/15/2005 **# of Pages:** 10
File Break: 03.07

452651 **MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - OCTOBER 15, 2005**

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 10/15/2005 **# of Pages:** 11
File Break: 03.07

452652 **MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - JANUARY 15, 2006**

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 01/15/2006 **# of Pages:** 11
File Break: 03.07

452666 **DRAFT PHASE 1A REMEDIAL INVESTIGATION (RI) REPORT**

Author: MACTEC ENGINEERING AND CONSULTING INC
Addressee: *MAINE DEPARTMENT OF TRANSPORTATION*
Doc Type: REMEDIAL INVESTIGATION (RI)
Doc Date: 04/01/2006 **# of Pages:** 1,384
File Break: 03.06

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Phase 03: REMEDIAL INVESTIGATION (RI)

452667 FINAL PHASE 1B WORK PLAN

Author: MACTEC ENGINEERING AND CONSULTING INC
Addressee: MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: WORK PLAN
Doc Date: 04/01/2006
File Break: 03.06
# of Pages: 1,206

452653 MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - APRIL 15, 2006

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 04/15/2006
File Break: 03.07
# of Pages: 13

452654 MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - JULY 15, 2006

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 07/15/2006
File Break: 03.07
# of Pages: 18

452604 FINAL WORK PLAN FOR THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)

Author: MACTEC ENGINEERING AND CONSULTING INC
Addressee: MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: WORK PLAN
REPORT
Doc Date: 07/28/2006
File Break: 03.07
# of Pages: 2,499

452655 MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - OCTOBER 15, 2006

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 10/15/2006
File Break: 03.07
# of Pages: 16

Phase 03: REMEDIAL INVESTIGATION (RI)

452656 **MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - JANUARY 15, 2007**

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 01/15/2007 **# of Pages:** 12
File Break: 03.07

452657 **MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - APRIL 15, 2007**

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 04/15/2007 **# of Pages:** 11
File Break: 03.07

274665 **FINAL PHASE 1B WORK PLAN, VOLUMES 1 TO 3 (TEXT, FIGURES, AND TABLES)**

Author: MACTEC ENGINEERING AND CONSULTING INC
Addressee: MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
Doc Type: WORK PLAN
Doc Date: 07/06/2007 **# of Pages:** 1,207
File Break: 03.07

452658 **MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - JULY 15, 2007**

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 07/15/2007 **# of Pages:** 11
File Break: 03.07

452668 **HYDRODYNAMIC OBSERVATIONS: AUGUST 24 - OCTOBER 29, 2006**

Author: WOODS HOLE GROUP
Addressee: MACTEC ENGINEERING AND CONSULTING INC
Doc Type: REPORT
Doc Date: 09/01/2007 **# of Pages:** 37
File Break: 03.06

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Phase 03: REMEDIAL INVESTIGATION (RI)

452659 **MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - OCTOBER 15, 2007**

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 10/15/2007 **# of Pages:** 19
File Break: 03.07

452669 **HYDRODYNAMIC CHARACTERIZATION AND SEDIMENT TRANSPORT POTENTIAL**

Author: WOODS HOLE GROUP
Addressee: MACTEC ENGINEERING AND CONSULTING INC
Doc Type: REPORT
Doc Date: 01/01/2008 **# of Pages:** 64
File Break: 03.06

452660 **MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - JANUARY 15, 2008**

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 01/15/2008 **# of Pages:** 10
File Break: 03.07

452661 **MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - APRIL 15, 2008**

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 04/15/2008 **# of Pages:** 9
File Break: 03.07

452645 **HEALTH CONSULTATION: LEAD IN CLAMS DATA REVIEW**

Author: US DEPT OF HEALTH AND HUMAN SERVICES
Addressee:
Doc Type: REPORT
HEALTH/RISK ASSESSMENT
Doc Date: 06/19/2008 **# of Pages:** 10
File Break: 03.09

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Phase 03: REMEDIAL INVESTIGATION (RI)

452646 HEALTH CONSULTATION: CALLAHAN MINE SUPERFUND SITE

Author: US DEPT OF HEALTH AND HUMAN SERVICES
Addressee:
Doc Type: REPORT
HEALTH/RISK ASSESSMENT
Doc Date: 06/30/2008
# of Pages: 27
File Break: 03.09

452662 MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - JULY 15, 2008

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 07/15/2008
# of Pages: 9
File Break: 03.07

452644 TECHNICAL ASSISTANCE REPORT: REVIEW OF LETTER WORK PLAN - CLAM TISSUE EVALUATION

Author: US DEPT OF HEALTH AND HUMAN SERVICES
Addressee:
Doc Type: REPORT
HEALTH/RISK ASSESSMENT
Doc Date: 07/25/2008
# of Pages: 7
File Break: 03.09

452670 TECHNICAL MEMORANDUM: CLAM TISSUE AND SEDIMENT SAMPLING, BIOACCESSIBILITY STUDY, AND RISK EVALUATION

Author: MACTEC ENGINEERING AND CONSULTING INC
Addressee:
Doc Type: REPORT
Doc Date: 09/01/2008
# of Pages: 113
File Break: 03.06

452671 TECHNICAL MEMORANDUM: DERIVATION OF PRELIMINARY REMEDIATION GOALS

Author: MACTEC ENGINEERING AND CONSULTING INC
Addressee:
Doc Type: REPORT
Doc Date: 09/12/2008
# of Pages: 42
File Break: 03.06

Phase 03: REMEDIAL INVESTIGATION (RI)

452672 WETLAND DELINEATION AND FUNCTIONAL ASSESSMENT REPORT

Author: MACTEC ENGINEERING AND CONSULTING INC
Addressee: MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: REPORT
Doc Date: 10/01/2008
# of Pages: 51
File Break: 03.06

452663 MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - OCTOBER 15, 2008

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 10/15/2008
# of Pages: 10
File Break: 03.07

452643 HEALTH CONSULTATION: REVIEW OF LEAD LEVELS IN CLAM TISSUE

Author: US DEPT OF HEALTH AND HUMAN SERVICES
Addressee:
Doc Type: REPORT
HEALTH/RISK ASSESSMENT
Doc Date: 10/24/2008
# of Pages: 10
File Break: 03.09

452615 GEOTECHNICAL EVALUATION REPORT

Author: MACTEC ENGINEERING AND CONSULTING INC
Addressee:
Doc Type: REPORT
Doc Date: 01/01/2009
# of Pages: 807
File Break: 03.06

452664 MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - JANUARY 15, 2009

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 01/15/2009
# of Pages: 9
File Break: 03.07

Phase 03: REMEDIAL INVESTIGATION (RI)

448640 **FINAL REMEDIAL INVESTIGATION (RI) REPORT: EXECUTIVE SUMMARY**

Author: MACTEC
Addressee: US EPA REGION 1
Doc Type: REPORT
REMEDIAL INVESTIGATION (RI)
Doc Date: 04/01/2009
# of Pages: 54
File Break: 03.06

448641 **FINAL REMEDIAL INVESTIGATION REPORT, CALLAHAN MINE SUPERFUND SITE**

Author: MACTEC
Addressee: US EPA REGION 1
Doc Type: REMEDIAL INVESTIGATION (RI)
REPORT
Doc Date: 04/01/2009
# of Pages: 3,685
File Break: 03.06

448642 **HUMAN HEALTH RISK ASSESSMENT, CALLAHAN MINE SUPERFUND SITE**

Author: MACTEC
Addressee: US EPA REGION 1
Doc Type: REPORT
HEALTH/RISK ASSESSMENT
Doc Date: 04/01/2009
# of Pages: 1,163
File Break: 03.10

448643 **BASELINE ECOLOGICAL RISK ASSESSMENT, CALLAHAN MINE SUPERFUND SITE**

Author: MACTEC
Addressee: US EPA REGION 1
Doc Type: REPORT
HEALTH/RISK ASSESSMENT
Doc Date: 04/01/2009
# of Pages: 2,131
File Break: 03.10

452665 **MAINE DEPARTMENT OF TRANSPORTATION QUARTERLY PROGRESS REPORT - APRIL 15, 2009**

Author: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: REPORT
Doc Date: 04/15/2009
# of Pages: 8
File Break: 03.07

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Phase 03: REMEDIAL INVESTIGATION (RI)

452692 MEMORANDUM REGARDING ECOLOGICAL RISK ASSESSMENT BENTHIC COMMUNITY ASSESSMENT [ATTACHMENTS: REVIEWS OF BENTHIC COMMUNITY STUDY PERFORMED IN SUPPORT OF THE BASELINE ECOLOGICAL RISK ASSESSMENT DATED JUNE 29, 2009 AND EPA MEMORANDUM DATED DECEMBER 19, 2008]

Author: EDWARD HATHAWAY US EPA REGION 1
Addressee:
Doc Type: MEMO
Doc Date: 06/29/2009
# of Pages: 33
File Break: 03.01

452695 REMEDIAL INVESTIGATION (RI) REPORT, HUMAN HEALTH RISK ASSESSMENT, AND BASELINE ECOLOGICAL RISK ASSESSMENT APPROVAL LETTER

Author: MARY JANE ODONNELL US EPA REGION 1
Addressee: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: LETTER
Doc Date: 06/29/2009
# of Pages: 1
File Break: 03.06

Phase 04: FEASIBILITY STUDY (FS)

452691 COMMENTS REGARDING REMEDIAL INVESTIGATION/FEASIBILITY (RI/FS) DRAFT WORK PLAN

Author: EDWARD HATHAWAY US EPA REGION 1
Addressee: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: LETTER
Doc Date: 08/08/2005
# of Pages: 1
File Break: 04.06
04.07

452690 COMMENTS REGARDING REMEDIAL INVESTIGATION/FEASIBILITY (RI/FS) STUDY SCHEDULE CHANGE

Author: MARY JANE ODONNELL US EPA REGION 1
Addressee: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: LETTER
Doc Date: 10/10/2006
# of Pages: 2
File Break: 04.06

452689 COMMENTS REGARDING REMEDIAL INVESTIGATION/FEASIBILITY (RI/FS) DRAFT PHASE 1B WORK PLAN

Author: EDWARD HATHAWAY US EPA REGION 1
Addressee: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: LETTER
Doc Date: 06/22/2007
# of Pages: 2
File Break: 04.06

Phase 04: FEASIBILITY STUDY (FS)

452688 **COMMENTS REGARDING REMEDIAL INVESTIGATION/FEASIBILITY (RI/FS) STUDY SCHEDULE CHANGE**

Author: MARY JANE ODONNELL US EPA REGION 1
Addressee: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: LETTER
Doc Date: 08/15/2008 **# of Pages:** 2
File Break: 04.06

452685 **COMMENTS REGARDING REMEDIAL INVESTIGATION/FEASIBILITY (RI/FS) STUDY SCHEDULE CHANGE AND CREATION OF OPERABLE UNITS**

Author: MARY JANE ODONNELL US EPA REGION 1
Addressee: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: LETTER
Doc Date: 02/25/2009 **# of Pages:** 2
File Break: 04.06

452687 **COMMENTS REGARDING REMEDIAL INVESTIGATION/FEASIBILITY (RI/FS) FEASIBILITY STUDY SCHEDULE**

Author: MARY JANE ODONNELL US EPA REGION 1
Addressee: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: LETTER
Doc Date: 04/16/2009 **# of Pages:** 2
File Break: 04.06

452686 **COMMENTS REGARDING REMEDIAL INVESTIGATION/FEASIBILITY (RI/FS) FEASIBILITY STUDY**

Author: MARY JANE ODONNELL US EPA REGION 1
Addressee: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: LETTER
Doc Date: 06/02/2009 **# of Pages:** 1
File Break: 04.06

452616 **MEMORANDUM REGARDING TIER 1 SEDIMENT CONSIDERATIONS**

Author: EDWARD HATHAWAY US EPA REGION 1
Addressee: STEPHEN ELLS US EPA REGION 1
Doc Type: MEMO
Doc Date: 06/22/2009 **# of Pages:** 41
File Break: 04.09

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Phase 04: FEASIBILITY STUDY (FS)

452696 FEASIBILITY STUDY (FS) REPORT APPROVAL LETTER

Author: MARY JANE ODONNELL US EPA REGION 1
Addressee: DWIGHT DOUGHTY MAINE DEPARTMENT OF TRANSPORTATION
Doc Type: LETTER
Doc Date: 06/29/2009 **# of Pages:** 2
File Break: 04.06

452677 PROPOSED PLAN

Author: US EPA REGION 1
Addressee:
Doc Type: PROPOSED PLAN
FACT SHEET
Doc Date: 07/01/2009 **# of Pages:** 20
File Break: 04.09

452698 FINAL FEASIBILITY STUDY (FS) REPORT (7/2/2009 TRANSMITTAL ATTACHED)

Author: PETER S BAKER MACTEC ENGINEERING AND CONSULTING INC
Addressee: STANLEY W REED MACTEC ENGINEERING AND CONSULTING INC
ME DEPT OF TRANSPORTATION
Doc Type: REPORT
FEASIBILITY STUDY (FS)
Doc Date: 07/01/2009 **# of Pages:** 611
File Break: 04.06

Phase 05: RECORD OF DECISION (ROD)

457577 PUBLIC COMMENTS FROM JIM SCHATZ REGARDING PROPOSED CLEANUP

Author: JIM SCHATZ STATE REPRESENTATIVE
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: LETTER
Doc Date: 01/01/1111 **# of Pages:** 2
File Break: 05.03

Phase 05: RECORD OF DECISION (ROD)

457581 **PUBLIC COMMENTS FROM JOHN FASSNACHT REGARDING PROPOSED CLEANUP**

Author: JOHN H FASSNACHT BROOKSVILLE (ME) RESIDENT
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: LETTER
Doc Date: 01/01/1111 **# of Pages:** 1
File Break: 05.03

457591 **PUBLIC COMMENTS FROM JOHN JOWLER REGARDING PROPOSED CLEANUP**

Author: JOHN JOWLER NONE
Addressee:
Doc Type: LETTER
Doc Date: 01/01/1111 **# of Pages:** 2
File Break: 05.03

457582 **PETITION TO REMOVE DAM STRUCTURE AT GOOSE FALLS**

Author: HARBORSIDE (ME) RESIDENTS
Addressee:
Doc Type: LETTER
Doc Date: 06/24/2009 **# of Pages:** 2
File Break: 05.03

457592 **PUBLIC COMMENTS FROM MURRAY GRAY REGARDING PROPOSED CLEANUP**

Author: MURRAY GRAY HARBORSIDE (ME) RESIDENT
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: LETTER
Doc Date: 06/24/2009 **# of Pages:** 1
File Break: 05.03

457583 **PUBLIC COMMENTS FROM DON HOLMES REGARDING PROPOSED CLEANUP**

Author: DON HOLMES NONE
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: MEMO
Doc Date: 07/14/2009 **# of Pages:** 1
File Break: 05.03

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Phase 05: RECORD OF DECISION (ROD)

457588 PUBLIC COMMENTS REGARDING IMPACT ON PENOBSCOT TRIBE

Author: ANDREW RADDANT US DEPT OF INTERIOR
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: MEMO
Doc Date: 07/17/2009 **# of Pages:** 1
File Break: 05.03

457580 PUBLIC COMMENTS FROM SANDECKIS REGARDING PROPOSED CLEANUP

Author: ALBERT E SANDECKI HARBORSIDE (ME) RESIDENT
Addressee: JEAN S SANDECKI HARBORSIDE (ME) RESIDENT
PAMELA HARTING-BARRAT US EPA REGION 1
EDWARD HATHAWAY US EPA REGION 1
Doc Type: LETTER
Doc Date: 07/23/2009 **# of Pages:** 2
File Break: 05.03

457587 PUBLIC COMMENTS FROM SASSY BETTS REGARDING PROPOSED CLEANUP

Author: SASSY BETTS HARBORSIDE (ME) RESIDENT
Addressee: DAVID B BETTS NONE
EDWARD HATHAWAY US EPA REGION 1
JEAN S SANDECKI HARBORSIDE (ME) RESIDENT
Doc Type: MEMO
Doc Date: 07/23/2009 **# of Pages:** 1
File Break: 05.03

457586 MEMORANDUM REGARDING BIDDING ON MINE CLEANUP

Author: RICHARD SWEET SWEET ASSOCIATES
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: MEMO
Doc Date: 07/27/2009 **# of Pages:** 1
File Break: 05.03

Phase 05: RECORD OF DECISION (ROD)

457579 PUBLIC COMMENTS FROM JODY SPEAR REGARDING PROPOSED CLEANUP

Author: JODY SPEAR BROOKSVILLE (ME) RESIDENT
Addressee: NAJI N AKLADISS MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
PAMELA HARTING-BARRAT US EPA REGION 1
EDWARD HATHAWAY US EPA REGION 1
Doc Type: MEMO
Doc Date: 07/31/2009 **# of Pages:** 2
File Break: 05.03

457584 PUBLIC COMMENTS FROM RETA HUNTER REGARDING PROPOSED CLEANUP

Author: RETA HUNTER HARBORSIDE (ME) RESIDENT
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: LETTER
Doc Date: 08/02/2009 **# of Pages:** 4
File Break: 05.03

457599 PUBLIC COMMENTS FROM JOHN VEAGUE REGARDING PROPOSED CLEANUP

Author: JOHN R VEAGUE HARBORSIDE (ME) RESIDENT
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: LETTER
Doc Date: 08/03/2009 **# of Pages:** 2
File Break: 05.03

457585 PUBLIC COMMENTS FROM KATHERINE SANDECKI REGARDING PROPOSED CLEANUP

Author: KATHERINE SANDECKI NONE
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: MEMO
Doc Date: 08/05/2009 **# of Pages:** 1
File Break: 05.03

457589 PUBLIC COMMENTS FROM BARBARA GANEM REGARDING PROPOSED CLEANUP

Author: BARBARA V GANEM NONE
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: LETTER
Doc Date: 08/07/2009 **# of Pages:** 2
File Break: 05.03

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Phase 05: RECORD OF DECISION (ROD)

457590 **PUBLIC COMMENTS FROM MDI BIOLOGICAL LABORATORY REGARDING PROPOSED CLEANUP**

Author: CELIA CHEN MDI BIOLOGICAL LABORATORY
Addressee: JOE SHAW MDI BIOLOGICAL LABORATORY
BRUCE STANTON MDI BIOLOGICAL LABORATORY
KEVIN STRANGE MDI BIOLOGICAL LABORATORY
CHARLES WRAY MDI BIOLOGICAL LABORATORY
EDWARD HATHAWAY US EPA REGION 1
Doc Type: LETTER

Doc Date: 08/09/2009 **# of Pages:** 3
File Break: 05.03

457563 **TECHNICAL ASSISTANCE GRANT (TAG) COMMENTS: FINAL STANTEC COMMENTS ON FINAL OPERABLE UNIT 1 (OU1) FEASIBILITY STUDY (FS) REPORT (WITH TRANSMITTAL LETTER)**

Author: CRAIG R GENDRON STANTEC CONSULTING
Addressee: MALCOLM STEPHENSON STANTEC CONSULTING
SALLY CHADBOURNE MERI
Doc Type: MEMO

Doc Date: 08/10/2009 **# of Pages:** 5
File Break: 05.03

457596 **PUBLIC COMMENTS FROM JODY SPEAR REGARDING PROPOSED CLEANUP**

Author: JODY SPEAR BROOKSVILLE (ME) RESIDENT
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: LETTER

Doc Date: 08/14/2009 **# of Pages:** 1
File Break: 05.03

457578 **PUBLIC COMMENTS FROM JODY SPEAR REGARDING PROPOSED CLEANUP**

Author: JODY SPEAR BROOKSVILLE (ME) RESIDENT
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: MEMO

Doc Date: 09/04/2009 **# of Pages:** 2
File Break: 05.03

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Phase 05: RECORD OF DECISION (ROD)

457597 **PUBLIC COMMENTS FROM JIM SCHATZ REGARDING PROPOSED CLEANUP**

Author: JIM SCHATZ STATE REPRESENTATIVE
Addressee: EDWARD HATHAWAY US EPA REGION 1
Doc Type: MEMO
Doc Date: 09/08/2009 **# of Pages:** 1
File Break: 05.03

457598 **MEMORANDUM REGARDING EXTENSION OF COMMENT PERIOD (ORIGINAL REQUEST ATTACHED)**

Author: EDWARD HATHAWAY US EPA REGION 1
Addressee: JIM SCHATZ STATE REPRESENTATIVE
Doc Type: MEMO
Doc Date: 09/10/2009 **# of Pages:** 1
File Break: 05.03

457914 **RECORD OF DECISION (ROD)**

Author: US EPA REGION 1
Addressee:
Doc Type: REPORT
RECORD OF DECISION (ROD)
Doc Date: 09/30/2009 **# of Pages:** 0
File Break: 05.04

457915 **EARLY ACTION MEMORANDUM FOR OPERABLE UNIT 2 (OU2)**

Author: MARY JANE ODONNELL US EPA REGION 1
Addressee:
Doc Type: MEMO
Doc Date: 09/30/2009 **# of Pages:** 12
File Break: 05.04

Phase 06: REMEDIAL DESIGN (RD)

452137 **REUSE ASSSESSMENT REPORT FOR THE CALLAHAN MINE**

Author: E2 INC
Addressee:
Doc Type: REPORT
Doc Date: 04/01/2009 **# of Pages:** 19
File Break: 06.04

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Phase 09: STATE COORDINATION

457904 SPILL REPORT FOR CALLAHAN MINE UST REMOVAL PROVIDED BY MAINE DEP

Author: MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
Addressee:
Doc Type: REPORT
Doc Date: 07/01/1987 **# of Pages:** 1
File Break: 09.01

Phase 10: ENFORCEMENT/NEGOTIATION

213098 ADMINISTRATIVE ORDER BY CONSENT (AOC) FOR REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS) DOCKET No CERCLA-01-2005-0022

Author: DAVID A COLE ME DEPT OF TRANSPORTATION
Addressee: DAWN R GALLAGHER ME DEPT OF ENVIRONMENTAL PROTECTION
DENNIS J HARNISH ME STATE OF
MAN CHAK NG US EPA REGION 1
MARY M SAUER ME STATE OF
ROBERT W VARNEY US EPA REGION 1
Doc Type: ENFORCEMENT SETTLEMENT
Doc Date: 06/07/2005 **# of Pages:** 86
File Break: 10.07

Phase 11: POTENTIALLY RESPONSIBLE PARTY

209843 NOTICE OF POTENTIAL LIABILITY - STATE OF MAINE

Author: SUSAN STUDLIEN US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION
Addressee: DENNIS J HARNISH ME STATE OF
Doc Type: LETTER
NOTICE LETTER
Doc Date: 05/14/2004 **# of Pages:** 10
File Break: 11.09

Phase 11: POTENTIALLY RESPONSIBLE PARTY

209844 **NOTICE OF POTENTIAL LIABILITY - CALLAHAN MINING CORP / COEUR D'ALENE MINES CORP**

Author: SUSAN STUDLIEN US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION
Addressee: WILLIAM F BOYD CALLAHAN MINING CORPORATION
CALLAHAN MINING CORPORATION
COEUR D' ALENE MINES INC
Doc Type: LETTER
NOTICE LETTER
Doc Date: 05/14/2004 **# of Pages:** 10
File Break: 11.09

209845 **NOTICE OF POTENTIAL LIABILITY - SMITH COVE PRESERVATION TRUST**

Author: SUSAN STUDLIEN US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION
Addressee: DOUGLAS F SCHLEICHER KLEHR HARRISON HARVEY BRANZBURG & ELLERS, LLP
SMITH COVE PRESERVATION TRUST
Doc Type: LETTER
NOTICE LETTER
Doc Date: 05/14/2004 **# of Pages:** 10
File Break: 11.09

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457564 **ARTICLE FROM WEEKLY PACKET: CALLAHAN MINE DISCUSSION LEAD TOPIC AT BROOKSVILLE MEETING**

Author: DAVID WALSH WEEKLY PACKET
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 01/01/1111 **# of Pages:** 3
File Break: 13.03

44322 **CALLAHAN MINE PUBLIC INFORMATION MEETING HANDOUT (JUNE 11, 2002)**

Author: US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
Doc Date: 06/11/2002 **# of Pages:** 5
File Break: 13.05

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250392 CALLAHAN MINE PUBLIC INFORMATION MEETING HANDOUT (JUNE 6, 2002)

Author: LESLIE MCVICKAR US EPA REGION 1
Addressee:
Doc Type: PUBLIC MEETING RECORD
Doc Date: 06/11/2002 **# of Pages:** 3
File Break: 13.04

448699 PRESENTATION: INVESTIGATING CONTAMINATION AT THE CALLAHAN MINING CORP SUPERFUND SITE [WITH LETTER OF TRANSMITTAL]

Author: LESLIE MCVICKAR US EPA REGION 1
Addressee: DALE WEISS TRC ENVIRONMENTAL CORP
Doc Type: PUBLIC MEETING RECORD
Doc Date: 03/05/2003 **# of Pages:** 40
File Break: 13.04

212568 FACT SHEET: COMMUNITY UPDATE (APRIL 2005)

Author: US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
Doc Date: 04/01/2005 **# of Pages:** 2
File Break: 13.05

213132 FACT SHEET: COMMUNITY UPDATE (JULY 2005)

Author: US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
Doc Date: 07/01/2005 **# of Pages:** 2
File Break: 13.05

253807 FACT SHEET: COMMUNITY UPDATE (JUNE 2006)

Author: US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
Doc Date: 06/01/2006 **# of Pages:** 8
File Break: 13.05

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452675 **SITE UPDATE PRESENTATION (JULY 2006)**

Author: US EPA REGION 1
Addressee:
Doc Type: PUBLIC MEETING RECORD
Doc Date: 07/06/2006
# of Pages: 24
File Break: 13.04

291376 **FACT SHEET: COMMUNITY UPDATE (AUGUST 2007)**

Author: US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
Doc Date: 08/01/2007
# of Pages: 4
File Break: 13.05

452676 **SITE UPDATE PRESENTATION (AUGUST 2007)**

Author: US EPA REGION 1
Addressee:
Doc Type: PUBLIC MEETING RECORD
Doc Date: 08/14/2007
# of Pages: 39
File Break: 13.04

452674 **SITE UPDATE PRESENTATION (JULY 2008)**

Author: US EPA REGION 1
Addressee:
Doc Type: PUBLIC MEETING RECORD
Doc Date: 07/16/2008
# of Pages: 48
File Break: 13.04

448656 **FACT SHEET: COMMUNITY UPDATE (APRIL 2009)**

Author: US EPA REGION 1
Addressee:
Doc Type: FACT SHEET
Doc Date: 04/01/2009
# of Pages: 6
File Break: 13.05

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452678 **PUBLIC MEETING POSTER: COPPER CONCENTRATIONS IN SEDIMENT ALONG THE NEW ENGLAND COAST**

Author: US EPA REGION 1
Addressee:
Doc Type: SAMPLING DATA
Doc Date: 04/01/2009
# of Pages: 1
File Break: 13.04

452679 **PUBLIC MEETING POSTER: COPPER DATA IN SEDIMENT**

Author: US EPA REGION 1
Addressee:
Doc Type: SAMPLING DATA
Doc Date: 04/01/2009
# of Pages: 1
File Break: 13.04

452680 **PUBLIC MEETING POSTER: ZINC DATA IN SEDIMENT**

Author: US EPA REGION 1
Addressee:
Doc Type: SAMPLING DATA
Doc Date: 04/01/2009
# of Pages: 1
File Break: 13.04

452681 **PUBLIC MEETING POSTER: LEAD DATA IN SEDIMENT**

Author: US EPA REGION 1
Addressee:
Doc Type: SAMPLING DATA
Doc Date: 04/01/2009
# of Pages: 1
File Break: 13.04

452682 **PUBLIC MEETING POSTER: CHEMICAL CONCENTRATIONS IN SEDIMENT ALONG THE NEW ENGLAND COAST**

Author: US EPA REGION 1
Addressee:
Doc Type: SAMPLING DATA
Doc Date: 04/01/2009
# of Pages: 1
File Break: 13.04

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452683 **PUBLIC MEETING POSTER: ZINC CONCENTRATIONS IN SEDIMENT ALONG THE NEW ENGLAND COAST**

Author: US EPA REGION 1
Addressee:
Doc Type: SAMPLING DATA
Doc Date: 04/01/2009
# of Pages: 1
File Break: 13.04

452684 **PUBLIC MEETING POSTER: LEAD CONCENTRATIONS IN SEDIMENT ALONG THE NEW ENGLAND COAST**

Author: US EPA REGION 1
Addressee:
Doc Type: SAMPLING DATA
Doc Date: 04/01/2009
# of Pages: 1
File Break: 13.04

457570 **ARTICLE FROM BANGOR DAILY NEWS: EPA SETS UPDATE ON MINE CLEANUP**

Author: RICH HEWITT BANGOR DAILY NEWS
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 04/21/2009
# of Pages: 1
File Break: 13.03

452136 **PUBLIC INFORMATION MEETING PRESENTATION (APRIL 2009)**

Author: EDWARD HATHAWAY US EPA REGION 1
Addressee:
Doc Type: PUBLIC MEETING RECORD
Doc Date: 04/28/2009
# of Pages: 28
File Break: 13.04

457571 **ARTICLE FROM BANGOR DAILY NEWS: EPA TO PRESENT MINE CLEANUP PLAN**

Author: RICH HEWITT BANGOR DAILY NEWS
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 06/06/2009
# of Pages: 2
File Break: 13.03

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452603 **CALLAHAN MINE PUBLIC INFORMATION MEETING HANDOUT (JUNE 9, 2009)**

Author:
Addressee:
Doc Type: PUBLIC MEETING RECORD
Doc Date: 06/09/2009 **# of Pages:** 22
File Break: 13.04

457566 **WEEKLY PACKET. (VOL 48, NO 29)**

Author: WEEKLY PACKET
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 06/16/2009 **# of Pages:** 3
File Break: 13.03

457565 **ARTICLE FROM WEEKLY PACKET: CALLAHAN MINE HEARING PROVIDES MORE INFORMATION ON CLEAN-UP PLANS**

Author: DAVID WALSH WEEKLY PACKET
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 06/18/2009 **# of Pages:** 1
File Break: 13.03

457572 **ARTICLE FROM BANGOR DAILY NEWS: PUBLIC MEETING SET FOR MAINE SUPERFUND SITE**

Author: ASSOCIATED PRESS
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 06/26/2009 **# of Pages:** 1
File Break: 13.03

457568 **ARTICLE FROM ELLSWORTH AMERICAN: MEETING IN BROOKSVILLE JULY 9 ON CALLAHAN MINE SITE**

Author: ELLSWORTH AMERICAN
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 06/29/2009 **# of Pages:** 1
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457573 **ARTICLE FROM BANGOR DAILY NEWS: EPA TO HOLD MEETING IN BROOKSVILLE JULY 9**

Author: BANGOR DAILY NEWS
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 06/29/2009 **# of Pages:** 1
File Break: 13.03

457561 **PUBLIC NOTICE IN THE ELLSWORTH AMERICAN FOR PUBLIC INFORMATION MEETING ON JULY 9, 2009 AND PUBLIC HEARING ON AUGUST 6, 2009**

Author: US EPA REGION 1
Addressee:
Doc Type: PUBLIC NOTICE
Doc Date: 07/02/2009 **# of Pages:** 1
File Break: 13.03

457562 **PUBLIC NOTICE IN BANGOR DAILY NEWS FOR PUBLIC INFORMATION MEETING ON JULY 9, 2009 AND PUBLIC HEARING ON AUGUST 6, 2009**

Author: US EPA REGION 1
Addressee:
Doc Type: PUBLIC NOTICE
Doc Date: 07/02/2009 **# of Pages:** 1
File Break: 13.03

457594 **NOTES FROM JULY 6 MEETING**

Author:
Addressee:
Doc Type: MEETING NOTES
Doc Date: 07/06/2009 **# of Pages:** 1
File Break: 13.04

457574 **ARTICLE FROM BANGOR DAILY NEWS: BROOKSVILLE RESIDENTS PLAN TO QUIZ EPA**

Author: RICH HEWITT BANGOR DAILY NEWS
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 07/07/2009 **# of Pages:** 3
File Break: 13.03

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452697 PUBLIC INFORMATION MEETING FOR PROPOSED CLEANUP PLAN

Author: US EPA REGION 1
Addressee:
Doc Type: PUBLIC MEETING RECORD
Doc Date: 07/09/2009
# of Pages: 45
File Break: 13.04

457575 ARTICLE FROM BANGOR DAILY NEWS: EPA EXTENDS DEADLINES FOR BROOKSVILLE MINE FEEDBACK

Author: RICH HEWITT BANGOR DAILY NEWS
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 07/11/2009
# of Pages: 3
File Break: 13.03

457569 ARTICLE FROM ELLSWORTH AMERICAN: BROOKSVILLE RESIDENTS WEIGH IN ON CLEANUP OF CALLAHAN MINE SITE

Author: CYNDI WOOD ELLSWORTH AMERICAN
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 07/16/2009
# of Pages: 2
File Break: 13.03

457900 PUBLIC HEARING TRANSCRIPT

Author: RON VENO & ASSOCIATES
Addressee:
Doc Type: PUBLIC MEETING RECORD
Doc Date: 08/06/2009
# of Pages: 19
File Break: 13.04

457576 ARTICLE FROM BANGOR DAILY NEWS: COMMENT PERIOD EXTENDED FOR MINE CLEANUP PROPOSAL

Author: RICH HEWITT BANGOR DAILY NEWS
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 08/12/2009
# of Pages: 3
File Break: 13.03

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457567 **WEEKLY PACKET. (VOL 48, NO 33)**

Author: WEEKLY PACKET
Addressee:
Doc Type: NEWS CLIPPING
Doc Date: 08/13/2009 **# of Pages:** 5
File Break: 13.03

Phase 16: NATURAL RESOURCE TRUSTEE

452693 **TRUSTEE NOTIFICATION LETTER - NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)**

Author: MARY JANE ODONNELL US EPA REGION 1
Addressee: KENNETH FINKELSTEIN US NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Doc Type: LETTER
Doc Date: 07/01/2009 **# of Pages:** 1
File Break: 16.01

452694 **TRUSTEE NOTIFICATION LETTER - UNITED STATES DEPARTMENT OF THE INTERIOR (DOI)**

Author: MARY JANE ODONNELL US EPA REGION 1
Addressee: ANDREW RADDANT US DEPT OF INTERIOR
Doc Type: LETTER
Doc Date: 07/01/2009 **# of Pages:** 1
File Break: 16.01

Number of Documents in Administrative Record: 127